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CYCLOPÆDIA
OF
OBSTETRICS AND GYNECOLOGY
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STERILITY:
Developmental Anomalies of the Uterus

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AND

THE MENOPAUSE

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WITH FIFTY FINE WOOD ENGRAVINGS.

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Sterility.

Developmental Anomalies of the Uterus.

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PART I.

STERILITY.

CHAPTER I.

INTRODUCTORY REMARKS.

BETWEEN the two chief functions of the more highly organized animals, the preservation of the individual and its procreation, there exists a vital difference. While the individual contains within itself those organs which are necessary for its own preservation, for its procreation it is necessary that two individuals of different sexes should, at certain periods, enter into the closest relation, the sexual union. For the begetting of individuals, such a transient sexual contact is indeed sufficient; but among mankind, following the example of many animal classes, two individuals enter into a lasting connection, which is strengthened precisely by the sexual union: Matrimony. This artificial sexual relationship, whether for the purpose of procreation or not, has in the course of time experienced many changes and taken on many forms. The ever-present state of civilization, economical relations and religio-ethical views of nations, have not remained without influence upon this, which in its firmly established form, is called marriage bond, and have given to it higher and more ideal missions.

Still, this sexual relationship does not always lead to the desired result; the reproduction of the individual is not always the sequence of this union. The marriage is unfruitful, it is childless. This lack of result of cohabitation, in contrast to those animal classes living in the same or similar sexual relationships, occurs very frequently. Though the statistics are not arranged in figures, which have been gathered through long periods of time and in large countries, we still possess valuable calculations from a number of physicians. Simpson found the ratio of sterile to fruitful marriages to fluctuate from 1:10.5 to 1:8.5. According to Spencer Wells and Marion Sims, the ratio is 1:8. Charles West gives the same ratio; Matthews Duncan finds from his researches that 15 per cent. of all marriages are sterile, which is therefore a more unfavorable figure. Although there may be many mistakes in these calculations, this much is certain, that these figures are very nearly correct, and the number of sterile marriages is far greater than it is usually believed to be.

It is true that the unfruitfulness of marriage does not play any very important part in the fluctuations of the populations of countries and nations; the number of sterile marriages in Germany, whose population is rapidly increasing, is certainly not smaller than in France, where the population increases but slowly. If, therefore, the state remains undisturbed, the results of marriage are in a high degree sufficient.

It is only seldom that the lack of descendants is not regretted by both husband and wife, or borne with quiet resignation; more often, and particularly among the wives, there is established a yearning for children, which, not being gratified, leads to psychical, far-reaching discord. If the husband also is not indifferent, and at the same time is not strong enough to conquer his dissatisfaction with the situation, which, in his opinion, is the fault of the wife, the door is opened for marital discord and reproaches, with all of their consequences. Particularly difficult to bear is the acquired sterility where, after the birth of dead children, conception no longer results, or where after the loss of children, no compensation is made. The married life is passed unhappily, for the majority of married people look upon a childless state as a terrible fate. The opinion of sterility in olden times was a more severe one, for connected with it was the idea of shame and disgrace, which among the Israelites and Romans was sufficient for a dissolution of the marriage relationship. A sterile wife is considered, even at the present time, by many people as an inferior being.

The Christian idea of marriage, as being a relation entered into for more ideal purposes, and the higher education, have ameliorated these opinions of sterile marriages, and have taken away from them their severe consequences. Sterility is regarded as unfortunate only by those so afflicted, and its removal is always sought for.

For a long time there hung over the sterile condition, as indeed over everything connected with the processes of procreation, a mysterious darkness, which was interesting enough to give rise to not a few philosophical, often fantastical views, which are recorded in literature. With the explanation which the researches of the last century have offered of procreation, and with the establishment of the fact that in this we have to deal only with physiological processes, even though they are complicated, it was necessary to regard sterility as an interference with natural bodily functions. The public, although they are always slow in following the views of physicians, have in a great measure accepted this view. Sterility is a disturbance of function, and from this condition relief must be sought at the hands of physicians. Indeed the confidence of those seeking relief, in the knowledge and capability of physicians, is often greater than that of the physician himself.

The great frequency of childless marriages, the importance attached to it by the afflicted parties, and the great assurance with which medical aid is sought, are sufficient reasons for a thorough study of the causes of sterility by physicians.

The importance which attaches to this condition shall be shown here in the study of sterility in both sexes, and will furnish in short chapters, extending in all directions, a scientific and practical treatise for the use of physicians.

Still, before I enter further into the examination of the causes of the interferences and disturbances which are at the bottom of sterility, as well as their diagnosis and treatment, it will be in place to interest ourselves first with the normal processes of procreation. I will, therefore, attempt to give a short and concise description of these processes, and shall follow almost entirely the admirable description of His, as regards history. I shall assume that the anatomical conditions are known, and shall speak particularly only of those opinions which rest upon later investigations. Several embryological observations appear worthy of notice. The opportunity is here offered to emphasize such points as are of importance in the study of sterility.

CHAPTER II.

HISTORICAL RETROSPECT.

THE study of procreation belongs to the most interesting division of physiology. The question as to the first beginning of human existence has, therefore, always engrossed the greatest and most intelligent men; it has always been the object of philosophical observations and research. It must not, however, be forgotten that not only philosophical desire, but also personal human interest has been active, for it was seen that only through the explanation of procreation could the knowledge and treatment of sterility be given a better and more solid foundation. The more unapproachable and difficult the procreative processes showed themselves, so much the more was it sought to solve this riddle of nature by speculative theories. It is, therefore, easily understood, that the fewer the positive facts of the details of procreation, the more prevalent were the most varied theories and hypotheses, which were partly promulgated by intellectual men, and were partly the products of unbridled fancy. That the opinions of the various medical and philosophical schools are reflected in these theories is easily understood.

If we look at the history of medicine in the time of Hippocrates, we will find the following complete theory of procreation advanced by him: The seed is an extract of the entire parts of the body, which is also formed by the woman, and their union results in the production of a germ. Both sexes contain besides, either at one and the same time, or alternately, a stronger masculine, or weaker feminine seed. From the intermixture of two stronger seeds, boys are produced; from two weaker ones, girls. If from one of the producing parties strong seed is put forth and from the other weaker ones, the question will be, which seed is the most numerous. "It is, as if Wax and Fat were mixed." The seed supplied by the weak portions is weak, that from the strong is strong; this distribution must reappear in the fruit, and this will resemble that one of its procreators who has given the greatest number of bodily parts. Aristotle is directly opposed to the theory that the seed arises from the entire body. "If the organs are separated in the seed, how can they live? if, however, they were united, we would already have a small animal," etc. His own theory of procreation is that the male furnishes the power of movement, and the female the material. He compares, for instance, procreation with the curdling of milk by rennet; the milk is the material, the rennet the power. He regards the menses as the material furnished by the female. Furthermore, he regards the existence of resistances which weaken or destroy the strength of the seed to the movements arising from the seed, which weaken or destroy the strength of the seed, and from this he explains the difference in the two sexes, for he regards females as undeveloped males. Galenus disputes the origin of the seed from the whole body, and says that it arises from a boiling of the blood in the spermatic vein, in the lower highly convoluted parts of which the transition of blood into seed may easily be appreciated. In females the same sexual organs are formed as in males, but they are placed in the interior of the body, and are not as fully developed. Now in general, parts which later lie externally are originally internal, for instance, the teeth in the maxillary bones and the eyes behind the closed lids; the principles of fire and air serve to bring them forward. The external advancement of the sexual organs occurs only in warm male fœtuses, while in cold, female fœtuses they remain internal. The uneven temperature of the two sides of the body is also a reason why the warm right side serves for the formation of males, the cold, left side for the formation of female children.

As is easily seen from these extracts from old authors, these views, which lived with but little change through all the Middle Ages, had their foundation more in speculation than in observations. It was only with the revival of anatomical studies at the end of the XVIth and beginning of the XVIIth centuries that a groundwork derived from facts was sought, and observations in relation to the first appearance of bodily formation were collected. After the movement had been inaugurated in Italy, and after the Paduan investigator, Fabricius ab Aquapendente, had supplied very full series of observations, the great scholar, William Harvey, undertook to investigate the origin of life upon a broader basis, and to bring it to a uniform point of view. Harvey's sphere of observation extended to invertebrates, in particular insects, as well as to vertebrate classes of animals, and he even made investigations into the development of large mammalia (the buck of the fallow deer). But the classical object for him, as for his predecessors, was the hen's egg, with which since that time, all works relating to developmental history have been connected. He was the first to recognize the germ as such, and followed it as it grew larger during hatching, saw the early appearance of the beating heart, the salient point, as he called it, and made many worthy observations of the successive appearance of the different parts of the body. Harvey showed himself also in his general perceptions to be one of the keenest and at the same time deepest thinkers who lived at that time, and he thought more clearly upon the existence of organic germs than all of the investigators of the following century. His saying "Omne vivum ex ovo," "All life is derived from a germ," is celebrated. But the germ, the *primordium vegetale,* as he called it, Harvey defined as a substance endowed with the power of development, which permeated the substance after life, and which caused it to take on the form of an organic body through the activity of an internal principle.

The particulars of the original formation remained unknown to Harvey, and his successors were no more fortunate in their researches, although in the course of the XVIIth century two of the foremost observers, Marc. Malpighi and Joh. Swammerdam, pursued developmental observations in all directions with great zeal and with great results. Malpighi's works on the development of plant germs, as well as his and Swammerdam's work on the metamorphoses of insects, have become standards for all time, not to mention numberless other advances for which we are indebted to these observers. And it is just their and particularly Swammerdam's so brilliant works that, instead of advancing, have placed the general conceptions of the existence of development far behind Harvey's time. As Swammerdam made the discovery that the organs of the butterfly are already arranged and are surrounded by a system of coverings before the caterpillar assumes the form of a chrysalis, he was led to further generalizations, to the idea that the development of higher organizations had their existence in a series of unfoldings and desquamations. Swammerdam believed that the constituent parts of the abdomen already existed in the egg, that they became larger, and that later on through the bursting of the surrounding envelopes they became visible.

This is a method of explanation which reaches further than Harvey's formless primordium vegetale, which is endowed only with internal forces. Swammerdam has gone still further in his conclusions: If the egg contains within itself a living element of all later appearing parts, then they must have existed previously in the ovary, and those which exist in these eggs must surround other appropriately placed organisms. Swammerdam points out how, according to this arrangement, every accident in the origin of existence is excluded. But he also deduces, especially for mankind, the opinion that the same conditions must have existed in every representative of the human race down to the one in the lap of our ancestress, Eve, and in this way Swammerdam has paved the way for the theory of evolution, which has become so portentous. But the ideas advanced by him with so much care were soon elevated by others to an unwarrantable dogma, and as such have prevailed for more than a century. Shortly after the appearance of the writings of Swammerdam, the well-known Père Malebranche appeared as a champion of the new doctrine, and he emphasized explicitly that our intellect was capable of looking further than to accept the narrow and fallacious opinion, even though it is mystified, that the Creator was restricted to the making of even smaller beings. Another disciple of this doctrine, Vallisneri, refers to the holy Augustin, who through his saying "God created all things at one time," sanctioned the doctrine of inclosure. The joining of natural and religious philosophical opinions by the help of the doctrine of evolution, was a favorite task with many speculative minds in the previous century, and in the first rank of these, in respect to the ingenuity and keen intellect with which he labored to develop his system and the persuasiveness with which he sought to promulgate it, stands the philosopher Ch. Bonnet.

But besides the above-mentioned speculative natural philosophers, the doctrine of evolution has numbered among its adherents some of the greatest observers, notably the Abbé Spallanzani, and above all the most noted biologist of the previous century, A. von Haller. After lengthy inward struggles, and after many investigations instituted to ascertain the truth, Haller finally committed himself, with certain reservations, to the doctrine of pre-existing germs, as being that doctrine which appeared to him to offer the least contradiction to known occurrences. All his endeavors to ascertain the first beginning of organic forms were baffled; where he had hoped to find such, he encountered only soft, slimy masses, and so he finally believed that the transparency of these masses was the reason for the invisibility of their framework. Moreover, Haller's knowledge of the processes of development was too deeply grounded to be satisfied with coarse representations. He, therefore, in no way believed that the parts already existed in the form in which they later appeared, but he looked upon them as formations whose later development through regular, pre-ordained influences brought them to that shape.

The opponents of the doctrine of evolution were called Epigenesists. A uniform doctrine of the Epigenesists had indeed never existed—in fact, totally different attempts were made by different sides to explain the new formation of organic bodies. Cartesius had already, in his paper on "The Formation of the Fœtus," described the generation of the body as a process of fermentation, developed by the mixture of supposed seminal fluids, and nearly eighty years later, Maupertius compared the process to the formation of complicated crystals. Others, as Buffon and Needham, took to their aid the supposition of organic molecules in the consideration of the meantime discovered world of microscopical organisms, and sought to build therewith more or less complicated and artificial systems of generation.

The theory of evolution was first shaken by the observations and investigations of Casp. Friedr. Wolff. He, in his inaugural dissertation, in 1759, "Theory of Generation," ventured the first attempt to enlarge the circle of empiricism more than that of his predecessors and contemporaries. Even this first attempt was a fortunate one, for in his studies on the younger plant and animal seeds, Wolff arrived at the settled view that the formation of organic bodies occurs gradually, and that it progresses successively from coarse sketchy outlines to finer development. This was an observation which directly contradicted the supposition of an infinitely small arrangement of organs in the doctrine of evolution. Still, in his first work, Wolff believed that he could explain the processes of formation by the introduction of an essential force, and it was only in his chief work, "The Formation of the Intestinal Canal," that he relinquished entirely the speculative construction, and substituted for it that groundwork, derived from observations, upon which our present knowledge of development is founded. C. F. Wolff was the first to arrive at the knowledge that the blastema of the bird's egg consisted of many superimposed layers, which, in the course of time, formed folds, from which separate organs were formed. He in fact pointed out how each one of the three primitive layers had its particular mission, and described how at first the nervous system originated, then the layer of fleshy portion, and upon this the formation of the vascular system, and finally the intestinal system followed. Wolff did not succeed in infusing his doctrines, which destroyed all the old-established views, for the matter sounded too strange, and the evolutionists were still too powerful. Finally, the doctrine of evolution was not vanquished by the extension of Wolff's ideas, but by the exaggerations of its own adherents.

The new practices and views acquired through C. Fr. Wolff remained quite unobserved as seed capable of development even to the present century. They were first brought to light prominently after Joh. Fried. Meckel had, in a certain sense, newly discovered and translated into German in 1811, forty-three years after its first appearance, Wolff's paper on the development of the intestinal canal. Through this an impulse was given, which caused the physiologist of Würzburg, Ignaz Döllinger, to prompt two of his scholars, Ch. Pander and C. E. v. Baer, to a revival of Wolff's investigations.

Through Pander, the study of the primary, leaf-like condition of the primitive layers of the body, initiated by Wolff, was brought to light. But in the hands of C. E. v. Baer, the facts of development of the higher organisms reached in a few decenniums a wonderful degree of perfection. Even yet the mammalia appeared in regard to their blastemal formations to occupy a separate position, but even these were shortly understood through the brilliant discovery of the ovum in the ovary of the mammalia by C. E. v. Baer in 1827, and upon which v. Baer immediately entered into the pursuit of earlier developmental gradations.

Since v. Baer, the transformation of the at first so simply formed blastema into the great variety of organs in the different animal classes, has been followed in a more thorough manner, and the respective works, although they have not yet reached the desired point, have rendered invaluable services for the proper understanding of the anatomy of complicated organs, such as the brain or the heart. For our general representations of the existence of development and formation, the special studies of organs have remained of unimportant influence; on the contrary, investigations of another character have become of the most convincing signification, and will, because they belong to our subject, shortly be mentioned. These are investigations into the constitution of the egg and of the seed.

As regards the ovule, different investigators, Steno, v. Horne, and above all, R. de Graaf, had, about the year 1670, reached the conclusion that the female germinal matter in mammalia must be identical with that of other animal classes; they had, therefore, given up the old opinion of female testicles in the mammalia, and had substituted for it that of the ovaries. How large the mammalian ovum was, and what its appearance was, they did not attempt at that time to say. As we now know, what were regarded by de Graaf as ovarian ova, were the receptacles in the interior of which the ovum reached perfection. These receptacles, the so-called Graafian follicles, are disproportionately large, in fact very much larger than those vesicles which de Graaf found in the Fallopian tubes of recently impregnated animals, and which he rightfully called ova. This inconsistency was completely solved by the discovery of the mammalian ovum in the ovary, by v. Baer. The knowledge of the position which the ovum bears to the remaining elements of the body, must also be regarded as a further advance. The proof furnished by Th. Schwann of the growth of all bodily tissue from a homogeneous substance, which, since his time, has been called the cellular element, led to the belief that the ovum also was such a cell element.

The first investigations into the male semen date back to the scientifically so fruitful XVIIth century. In 1677, Ant. v. Leeuwenhoeck, one of the fathers of microscopic investigation, had his attention called to the appearance of movable elements in the male semen, by a young man, Ludw. v. Hammen. At first attaching but little weight to this discovery, Leeuwenhoeck presently found himself constrained to go more deeply into this matter, and after he had convinced himself by a series of the most complete and wide-spread investigations, of the general distribution of these living spermatic elements throughout the animal kingdom, as well as of their passage into the Fallopian tubes, he considered himself justified in ascribing to them an important meaning in the embryological formation, and he then formulated his idea that the spermatozoa developed directly into the embryo in the interior of the uterus. Leeuwenhoeck's investigations into the spermatozoa must, on account of their thoroughness, be looked upon as classical, for his conclusion in regard to their importance in procreation appears even to-day to be well-founded, and only as regards the definite termination has his conjecture not held good. Leeuwenhoeck's opinion was accepted by several prominent philosophers, notably Leibniz and Boerhave; nevertheless they did not receive universal recognition. The prevalence of the doctrine of evolution was partly the cause of this, but his idea was partially brought into discredit, because certain imaginative writers advanced extravagant assertions, that bore the stamp of falsehood on their face.

As it was impossible to deny the existence of these elements, they were satisfactorily looked upon in the last century as parasitic formations, or, as they were preferably called, vermiculi seminales. Even that investigator, the Abbé Spalanzani, to whom we are indebted for the most thorough experiments into the fructifying influence of animal semen, regarded the spermatozoa as altogether indifferent formations, and it was only in the twentieth year of our century that this false view was dispersed, in that two French physiologists, Prévost and Dumas, attempted to show, by the artificial impregnation of frog spawn by means of thinned semen, that only a very small number of spermatozoa are necessary for fructification, while semen free from spermatozoa was always without result. The last supposition of a heterogeneous origin for the elements spoken of was in the course of time contradicted by the fact, first made known by Kölliker, that they originated in the interior of certain gland cells.

A further important step in the estimate of the spermatozoa was made by the discovery, in the beginning of the fiftieth year, of their entrance into the female ovum. A number of investigators, among whom were Newport and Barry, contributed proofs to the at first incredulously observed fact, and on this occasion our knowledge of the formation of animals' ova was markedly increased by the discovery of widely disseminated entrances in the envelopes of the ovum, the so-called micropyles. A still further important advance was made in the last decennial period, by the better understanding of the processes which take place at the meeting of the ovum and the sperma. The preparatory segmentation, the division and separation of the blastodermic vesicle, the mixing of the spermatozoa with the nuclei of the ovum, are extremely important discoveries, whose great bearing may be imagined but cannot as yet be seen. These results of investigation may be of great benefit also for the study of sterility in the future.

CHAPTER III.

PROPAGATION IN GENERAL.

THE propagation of the single individual, called procreation, does not occur in the organic world in any regular order. In these processes, two species may be differentiated, according to whether one single individual is sufficient to propagate other individuals of its own kind, or whether it requires two individuals with different organs to beget new individuals. In the first case, we speak of an asexual, in the latter of a sexual propagation. The first form occurs most frequently among the lower organisms of both kingdoms, the second among the more highly organized. Still no sharp line of differentiation can be noticed, since so many transition gradations, which we shall shortly speak of, exist between the two species. These mixed forms, if I may so express myself, are very numerous, and show themselves by very complicated processes. We will now describe briefly, and without reference to the above-mentioned differentiation, the different varieties of propagation.

In earlier times the so-called spontaneous generation (equivocal generation) played an important part in the subject of propagation. The fact that in places where all life appeared to be extinguished, as in decomposing organic material, stagnant water, etc., countless numbers of inferior animals shortly appeared, led to the belief that living beings might originate from dead material by a species of fermentation. Careful observation and detailed investigation have, in the course of time, shaken and narrowed the belief in this parentless propagation; later investigations have also done away with whatever there was remaining of this belief. The equivocal generation will, in the future, play a part in imaginative speculations and audacious hypotheses of the origin of every living thing. As regards the procreation of the present organism, the sentence "Omne vivum e vivo," is indisputable.

Just as in the growth of an organ the multiplication of cells by division plays an important part, so in single-celled plants and animals propagation is accomplished in a similar way. An importance is also attached to the rich or excessive supply of nourishment in the formation of descendants, which is marked in the lower organisms, and although not as noticeable in higher organisms, does not disappear altogether. The segmentation of the mother animal or mother plant, which leads to its division into two individuals, may occur in several ways. It may be a complete one, so that the newly-formed individual is entirely independent of the older one, or the separation is only an incomplete one, in that the newly-formed individual remains in connection with its parent, which relationship is manifested by the further division of other previously formed individuals, a relationship which finds its expression in the so-called animal stems. But, as is well-known, many compound-celled animals and plants may be artificially divided, and each part may then exist as a separate being, so also among compound-celled species may propagation occur by a natural division. Another method of propagation is that by budding, as occurs among the lower animals and higher plants. At any, or as is often the case, at a particular spot on the mother organism, a growth appears, which by its further development forms an individual. But this process is not always a simple one by any means, but may show itself in many ways. This bud may indeed immediately assume the same form as its progenitor, or at least resemble it, or it may arrive at this result only after certain changes. From the bud arises an existence different from that of the mother (larvæ formation), and from this the new individual developes (metamorphosis). Or this off-shoot becomes changed into an individual different from the mother organism, which in an asexual way in one or two generations is propagated as an independent being, and out of which eventually an individual is again produced, which resembles the original species (generative alternation in the narrow sense). Even though the separation of the bud from the mother organism does not occur, there is here again a motive for the formation of animal classes.

Another species of propagation of an asexual character is that by the formation of spores. The cast-off cell does not immediately arrive at the dignity of a new individual, but its form undergoes many changes, and only later, under favorable circumstances, becomes converted into a new independent variety. The spores are very often formed in large numbers in the interior of the cells, and the daughter cells then are freed by the death of the mother cell.

Propagation by germination is closely related to that by budding. Here cells, or similar formations, are formed in the interior of the organism, from which new individuals of the same sort originate directly. Among higher organizations, the germs are generated in a particular part of the mother organism, which portion then assumes the function of propagation, and in still more highly developed organisms takes on the form of a germ-preparing organ. By still further progressive advances in development the germs prepared in these organs, in contradistinction to other cells, take on particular forms and are now called eggs or ovules.

Even though, as in this asexual propagation, only one individual and only one variety of germ is sufficient to produce, either directly or indirectly through transition creations, new individuals, it is well known that for this purpose, among the more highly organized beings, two differently formed individuals with two different germs are necessary. As has already been said, these two varieties are sharply outlined only in their extremes, while between them a series of transitions may be found. These transitions are particularly marked in two forms. Among certain animals, and exceptionally among plants, a germ or ovum is nurtured, from which a new being may proceed without any other influence—consequently in an asexual manner. The individual itself, however, by which this germ is produced, is by no means sexless, but is indeed, as among all sexually propagating creations, a distinctly formed individual, and is in fact, a female. But what is more, the latter is capable of copulation, and of propagating itself in the ordinary way. We have, therefore, on the one hand, an asexual variety of propagation following precisely the type of the lower organisms; on the other hand, we have a sexually formed individual, which can reproduce itself sexually, as is the case among the more highly developed beings. This process, which only occurs among females, and which is only capable of bringing forth descendants of one sex, is called Parthenogenesis. It bears a certain relation to the previously mentioned metamorphoses and generative alternation, and corresponds in so much to the sexually propagating organisms, that certain changes in the ovum, which initiate the formation of a new being and which formerly were thought to be impossible without impregnation, are accomplished without the aid of the latter.

A further method of reproduction, and one which corresponds more closely to the sexual method, is the propagation by auto-impregnation. While in the sexual method, two differently formed individuals and two different germs are necessary, in this auto-impregnation only two different germs are necessary. Two kinds of germs exist, which commingle, but only in one individual, called hermaphrodite or hybrid. The first beginning of auto-impregnation shows itself there, where those two neighboring cells, enclosed in the same germinal organ, show a different structure; masculine cells, or foreshadowings of spermatic cells, and feminine cells or ova. The descendant produced by the union of these two elements is formed externally by a simple excretion. In others the separation has advanced still farther, in that the germs are formed in widely separated and differently constructed organs, and are carried out through separate excretory ducts. But here also the impregnation may occur in the interior of the hermaphroditic abdomen, inasmuch as the ovum and spermatic fluid may be brought in contact by means of communicating channels. In other hybrids again, the union of the two germinal elements can only take place externally to the organism, on account of the completely separated excretory ducts. When the ripening and expulsion of the products of the two different germinal glands does not or cannot coincidently follow, and in consequence the excreted spermatic fluid and the ova can only come in contact with great difficulty or not at all, it must be regarded as an important approach to the sexual procreation. In this form spermatic fluid and ova must be blended if descendants are to result This condition, whereby each individual can assume the function of a male or female, is also called alternating impregnation. It requires indeed two individuals, but these two individuals are similarly formed. Both contain the two necessary germinal elements. A differentiation into two sexes, whereby a complete division into a male and female participation in impregnation occurs, has not yet been made. Auto-impregnation occurs not only in a large number of animals, but, as is well known, plays an important part in the vegetable kingdom.

The most complete, and, according to general opinion, the most fruitful method of propagation is the sexual. This method requires the participation of two individuals, who, in essentially differently constructed organs, produce differently formed elements, by the intimate union of which a new individual can be produced. As universally as this occurrence is carried out in principle, it is shown in more forms in the broad territories of the higher organized creations of both kingdoms. The two individuals hereto necessary show generally a very similar bodily construction, but are often so different in their size and manner of living that it is very difficult to see any intimate relationship between them. The structure, also, of the germ-preparing organs admits, between the greatest simplicity and greatest complication, of all possible transitions. The sexual germs themselves experience fewer modifications. The round ovum, with its characteristic contents, vitellus, blastodermic vesicle and germinal spot, repeats itself with but little variation in that form. Less so among the seminal formations; but here also, that peculiar, elongated form and its division into three portions, head, central portion and tail, is not hard to recognize. As opposed to this, the greatest variety is found in the approach and final union of the two necessary elements, as well as in the participation of the parents in this act. The meeting of seminal fluid and ovum occurs from the greatest as well as the shortest distances, through various media and forces, by the most intimate bodily union, or again through locally and temporarily separated acts of both procreators. One thing, however, remains constant: the material blending of both sexual germs.

As interesting as it is to follow this process in its various forms, we have in our study an interest only in the manner and way in which this process occurs in the most highly organized mammalia, mankind. A short description of these processes as they occur in the human species will be given in the following chapters.

CHAPTER IV.

EMBRYOLOGICAL SKETCH.

IN the beginning of human fœtal development, the embryo is sexless, or, better expressed, it contains within itself the rudiments of both sexes, without one's being able to say whether male or female sexual organs will be developed from it. These rudiments consist of the primitive kidneys or Wolffian bodies and their excretory ducts, which early develop from the lateral plates adjoining the primitive vertebræ. To these are added later on and on their inner side, the two Müllerian ducts. In the fifth week, on the inner side of the Wolffian bodies, and closely adjoining them, the rudiments of the sexual glands are developed, which for some time do not indicate whether they will be of the male or female kind. As soon as the sex is determined, which is shown by a change in the form, position, and principally in a differentiation in the internal structure, the formation of the permanent generative organs is continued, in that only a part of the above-described rudimentary layers is utilized, while the other part remains rudimentary or completely disappears. The peculiarity of this is that the part, which is further developed in males, remains stationary in females and *vice versa.* If the development does not proceed in this way, but parts develop which should remain stationary, or if others are arrested in their growth instead of progressing to complete development, those hybrid formations are produced which are difficult to distinguish sexually, so that very often cause is given for doubt.

If the sexual glands have become converted into the testicles, these gradually become united with the excretory ducts of the Wolffian bodies. This canal forms itself into the lower part of the epididymis, the spermatic duct and vesicle, but the Wolffian bodies are partly changed into the head of the epididymis, while the Müllerian ducts almost entirely disappear and only remain in scanty rudiments, as the vesicula prostatica or masculine uterus. If the sexual glands are changed into the ovaries, then the Müllerian ducts are further developed, and their upper portions become changed into the tubes, and their middle and lower portions are blended, so that the septa between the two canals disappear and the common cavity becomes changed into the uterus and the vagina; the Wolffian body remains rudimentary and appears later as the Parovarium, while its excretory duct in mankind almost disappears, and is only met with as Gärtner's duct.

CHAPTER V.

OVULATION.

THE most important procreative organ, which also exerts an influence upon the bodily and mental development, is the double sexual gland, which serves for the production and conservation of the impregnating elements. In the beginning of embryological development, no trace of it can be found; it is only in the fifteenth or sixteenth week after the formation of the so-called primitive kidney or the Wolffian body, that, on the posterior wall of the abdominal cavity, and on the side of this organ and in connection with it, two white stripes are seen, which are without doubt to be regarded as a growth of the peritoneal epithelium. Through rapid growth of this germinal epithelium cell-aggregation, this is more sharply defined from the neighboring structures, and appears early in the abdominal cavity as an organ supplied with a mesentery, while at the same time the basic membrane also grows and is supplied with vessels.

Until the end of the second month there is in this organ, now called the germinal gland, no sexual difference noticeable; the embryo is still sexless. At this time there first begins that differentiation which makes itself known by the change in the external form, the position and particularly in the internal structure, and which eventually leads in females to the development of the ovaries, and in males to the testicles. The transformation of the germinal gland into the ovary occurs by an intergrowth of the two tissue elements, the germinal epithelium and the basic membrane. This process is completed in the following way. The germinal epithelium of the surface sends solid, branching processes into the interior of that layer, from which organs are developed, where they take on an appearance similar to the glandular tubes (Pflüger's tubes). At the same time connective tissue and cellular trabeculæ penetrate from the hilum in processes into the germinal epithelium, which has also become adherent to the centre. Thereby separating walls are formed not only between the trunks and branches of the glandular tubes, but the latter are divided or shut off into single divisions of different sizes by other lateral growths of connective tissue, so that glandular tubes connecting with the surface no longer exist, but the epithelia which join the tubes are pressed into roundish balls, and are surrounded by connective tissue. In this way, then, the two histologically different parts of which the ovaries consist are formed: first, the connective tissue basic membrane, the stroma which forms the principal substance of the organ, and which sends out processes toward the surface, which carry the blood-vessels and nerves, and which contain the smooth muscular tissue; second, the glandular portion, which principally forms the cortical substance, and which contains the branches of the glandular tubes, the cell-aggregations and later follicles, which are entirely surrounded by the connective-tissue stroma.

But a further important change in the germinal cell occurs before this process of growth. In the superficial layers as well as in those deep epithelial projections, single cells enlarge and assume a spherical form, so that they are more or less sharply defined from the neighboring cells; these are the so-called primitive ova, from which the true ovules develop. Now, for the first time, the germinal organ assumes the character of a female sexual organ. These ova may now be imprisoned in the cell-aggregations above-mentioned by the occlusion of the glandular tubes, or one cell of these cell-aggregations may be converted into an ovum.

In these cell-aggregations, after their separation, a certain arrangement takes place, by which those cells which have not lost their epithelial character are placed against the wall formed from the stroma, and include between them those cells which have become changed into ova. These formations which exist in a disproportionately considerable number, and which furnish the rudiments of the later Graafian vesicles, are called primary follicles. Only after the termination of the embryonal stage, during which the organ has sunk deeper, even if not completely into the true pelvis, and has assumed an elongated, tongue-like flattened form, do further changes occur in this principal portion of the ovary, in that the true, or so-called Graafian follicles develop from these cell-aggregations. Under the influence of those blood-vessels which pass through the stroma, and which surround the single cell-aggregations, a transudation takes place between the epithelial cells. By this the space, until now occupied only by the cells, is enlarged, but the epithelial cells, which are greatly increased in number, are, with the ovum, pressed against the side of the cavity. The clear liquid which now occupies the central portion of the vesicle forms the greater portion of the contents.

According to recent views, all the ova are formed during the embryonal period, and an increase of these does not occur. The number of these ovules, according to the investigations of Sappey and of Henle, is an unusually large one. Since, at a given moment in the puberal period, the number of follicles is a relatively small one, a large number of follicles must remain in their incomplete form (cell-aggregations without fluid) even after puberty. But as the demand for ova, in comparison to the number of these incompleted follicular rudiments, is a very small one, the greater part of this follicular foundation with its ova must become destroyed in the stroma of the ovary sooner or later. In fact, the remains of such destroyed follicles are found partly as folded membranes, partly as fattily degenerated masses. Only a small number of ovules are therefore of use.

While, therefore, the foundation of the ovary is completed before birth, there appears after this a period of rest. Even though here and there small vesicles are met with in the ovary during childhood, the further development of the follicular apparatus does not proceed until the appearance of puberty, and only with the completion of this is the ovary to be considered as fully developed. At this time, that position, form and appearance, which we look upon as normal, shows itself. The proper function of the organ now begins: the maturing and extruding of the ovules formed coincidently with the ovary. This process is, according to the present view, not a continual, but a periodical one, which occurs principally in the follicles. Under the influence of a congestion of the genitals, usually recurring every four weeks, there is a marked increase in the fluid contents of a number of follicles; still, as a rule, only one ovum is thrown off in the course of a lunar month. One of the follicles, enlarged by a previous congestion, approaches the surface of the ovary by the further increase of its fluid contents, and the stroma, which lies between the wall of the vesicle and the epithelial covering, is at first thinned and then disappears altogether, so that the follicular wall causes the surface of the ovary to arch forward. Hereby the most prominent part of the wall, which is free from the network of blood-vessels which surrounded the follicle, also undergoes a marked thinning. By the increase of this pressure exerted by the fluid contents, that part of the follicular wall which projects into the abdominal cavity is ruptured. It is also possible that the smooth muscular tissue contained in the stroma, increase, by great tenseness, the pressure in the follicle and assists in its rupture. But it is not probable that an extravasation of blood into the Graafian follicle assists: the rupture of the vessels occurs probably after the emptying of the follicle, and is caused by the sudden diminution of the forcible intra-vascular pressure. The fluid of the follicle is now emptied through the opening, and the ovum—which usually, but not always, lies on the side opposite to the rupture, and is, with its surrounding cells, forming the so-called discus proliferus, already loosened from connection with its foundation—is, with the discus oophorus, carried into the abdominal cavity.

The change which the ruptured follicle undergoes is somewhat different, according as to whether the extruded ovum is impregnated or not. After the escape of the fluid contents, the opening is closed by the formation of a delicate cicatrix; the membrana granulosa, consisting of epithelial cells, arranges itself in folds, which enclose a small quantity of pure blood. In place of the resorbed blood, yellow masses appear, which consist of yellow pigmented, granular, multiformed cells. Whether these arise from wandering white blood-corpuscles, or whether they arise from a luxuriant growth of the cells of the membrana granulosa is not certain. Coincidently, connective-tissue processes are sent out from the enveloping membrane of the follicle, which attach themselves at about the centre of the vesicle and which carry blood- and lymphatic-vessels, and which cause the later cicatrization of the changed follicle. In the impregnated female, under the influence of the permanent congestion of the genitals, the former follicle, which on account of its intensely yellow color is called the corpus luteum, and which shows greater dimensions than the follicle from which it originated, remains until the termination of the pregnancy; then the yellow masses disappear and a true nodule, the corpus albicans, is formed by the production of connective tissue. If the blood-vessels are destroyed, the coloring matter of the blood is liberated, and this small body is given a blackish hue, the corpus nigricans. This formation is then forced into the interior by the enlargement and advancement of other follicles to the surface, and is then later on completely destroyed. Much less intense and of much shorter duration is the retrogressive metamorphosis if conception has not resulted. The body remains small, does not exhibit any yellow color and soon disappears. This process just described, is, in its entirety, called ovulation.

CHAPTER VI.

THE TRANSMIGRATION OF THE OVUM.

THE ovule extruded from the ruptured follicle is taken up by the tube, and carried to its destination; the uterus. The Fallopian tubes, the excretory ducts of the female sexual glands, consist of the upper portions of the ununited Müllerian ducts, which embryologically are not in connection with the ovaries; this accounts also for the extremely delicate, incomplete and slight connection of the abdominal end of the tube with the ovary. The manner of the transmission of the ovum in the human species is as yet uncertain. A series of hypotheses have been advanced, but only to be relinquished. I will only mention the recent view of Plank, that a union between the tube and ovary is effected by normal adhesions, which permit of the passage of the ovum. Slight pathological processes, which appear also to be not infrequent among animals, have certainly given rise to this view. And that older view, recently revived by Kehrer, that the ovum is projected with a certain amount of force into the infundibulum of the tube, has this against it, that the intestinal loops would surely lie in the way.

If we take into consideration the anatomical formation of this division of the genitals, and call to our aid comparative physiology for an explanation, we find that there can be only two powers capable of bringing about the transmission of the ovum: *the erection of the fimbriated extremity and the ciliary movement of the mucous membrane of the tube.* That by a marked distension of the numerous blood-vessels, resembling spongy or cavernous tissue, of the abdominal portion of the Fallopian tubes, the latter may become erected, and in that way approach the ovary, can be shown experimentally, even though the movements that then appear can by no means be looked upon as satisfactory and efficacious. Still, experiments upon animals, which were instituted during the period of ovulation, furnish proof of the view that such a movement directed towards the surface of the ovary does in fact exist, whereby the fimbriæ are placed in apposition to the organ, or glide to and fro on it. With these erectile processes, whether occurring naturally or induced artificially, the contraction of the muscular tissue, which is quite profuse in this neighborhood, may co-operate, as is emphasized by Rouget. The force with which this erection is caused, must, however, be a tolerably powerful one, since it must overcome the resistance of the overlying intestines.

The second power lies in the ciliary cells, which line the ampulla of the tube, and since the ciliary movement of the ciliary processes is directed from the abdominal cavity toward the uterine, the mucous membrane is without question in a condition to carry the extruded and received ovum to the narrow part of the tube. The great capability of the ciliary movement principally, as well as the fact that among the lower animals an ovum lying free in the abdominal cavity is brought from a considerable distance to the tube by this force alone, speaks positively for the probability that this arrangement plays an important, if not the most important part also in the human species. For it is not improbable that the ciliary movement manifests itself beyond the ampulla, in that it brings about that constantly occurring flow of the normal fluid on the surface of the peritoneum, toward the ampulla of the tube, and thereby also carries the ovum, extruded from the ovary and taken up by the flowing fluid, into the excretory duct of the ovary. By the incomplete union of the ovary and tube, and, as it appears, by the insufficient capability of movement of the fimbriæ, there cannot be ascribed to the erection of the abdominal tubal end, originated and maintained by the catamenial congestion of the genitals, the power of grasping the extruding ovum directly, but only the power of drawing near the surface of the ovary. The principal activity would be ascribed to the ciliary movement, which not only would carry the ovum through the free peritoneal cavity, but also through the ampulla to the narrow part of the tube. The movements of the fimbriated extremities could only be looked upon as an auxiliary action.

The further advancement of the ovum through the narrow part of the tube is brought about by the force of the ciliary movement; peristaltic action of the circular muscular tissue of the tube probably aids in the advancement of the ovum. The passage through the tube occupies several days, according to investigations among the higher classes of animals. This period is not a fixed one in the human species. Only in the event of pregnancy does the ovum remain in the uterus; if this does not occur, the ovum dies and is thrown off. The process repeats itself then in the same way, after the lapse of the time before mentioned.

If the ovum is impregnated, the maturing and detachment of new ova ceases; very probably also during the retrogressive metamorphosis of the genitals (puerperium). Ovulation appears to be arrested also during lactation, but still only at the beginning of this epoch, for conception during protracted suckling is certainly not infrequent.

CHAPTER VII.

MENSTRUATION.

COINCIDENTLY with ovulation, there occurs another process, menstruation, or a physiological outpouring of blood from the uterus for some days. This likewise makes its first appearance at the time of puberty, and returns more or less regularly at intervals of four weeks; is interrupted in healthy women only during the time of gravidity, and usually during the period of lactation, and ceases at about the same time as does ovulation, at the so-called climacteric period. While it was formerly generally believed that the hemorrhage took place from the intact mucous membrane of the uterine body, whether by rupture of the capillaries or by diapedesis, in recent times the view that the hemorrhage is a result of fatty degeneration and throwing off of the upper and middle layers of that membrane, is more believed. The cause then, whether one believes the process results in the one way or the other, lies in a periodical congestion of the genitals. In the first way, the hemorrhage would occur at the height of the hyperæmia, in the second, the degenerative process is caused by the hyperæmia, but the exfoliation and its consequent hemorrhage follows only after the cessation of the congestion. Recent investigations, however, make it seem probable that such radical changes of the mucous membrane are not intimately connected with menstruation, that the exfoliation extends only to the epithelial covering, or at most only involves the superficial layer; briefly, the separation is confined, as in acute simple catarrh of the mucous membrane, to the superficial elements, an injury which is quickly repaired.

These two processes, ovulation and menstruation, were formerly looked upon as cause and effect. The cause of both was supposed to be the slowly developing Graafian follicles, from the time of puberty. By their enlargement, a continual pressure was supposed to be exerted upon those nerves which passed between them in the ovarian stroma. This irritation is conveyed to the central nervous system, and by reflex action, causes, after a certain degree of irritation has, by cumulative action, been reached, an arterial congestion of the genitals. This hyperæmia then leads on the one hand to a more active transudation into the most matured Graafian follicles, and causes, as already explained, a rupture of these with extrusion of the ovum, ovulation; on the other hand, it causes at the same time an excessive hyperæmia of the uterine mucous membrane, and occasions the periodical hemorrhage, menstruation.

As well grounded as the opinion of a causal and temporal relation of the two processes seemed to be, certain considerations still gave reasons for doubt; these were founded on the fact that anatomical investigations had proved that a rupture of a follicle might occur without menstruation between two catamenial hemorrhages. This discovery did not negative the belief that ovulation and menstruation, two coincidently occurring processes, were related to each other as cause and effect, but only weakened the belief that they occurred coincidently. But the above-mentioned results of investigation, which moreover leave room for many exceptions, are opposed to many other facts, which serve as substantial supports for the previous belief. The swelling of the ovary, which points in that direction, and which can be substantiated by a series of authors from observations made during the menstrual period on ovaries, while superficially placed (ovarian herniæ), is also proved to be true of the normally situated ovaries, by the investigations of v. Holst and Joh. Meyer; the preponderating frequency with which a single completed cohabitation, directly following menstruation, leads to conception, which is not the case in later occurring cohabitations, lends support to the older view. As proof of this may be cited the investigations of Hasler, and more convincingly, the compilation made by E. Wachs, of a series of observations made by Cederskjeld, Veit, Hecker and Ahlfeld, according to which, in not less than 138 of 194 cases, coition occurred between the first and twelfth day after the beginning of menstruation. And although the great fruitfulness of the Israelites, in whom intercourse is supposed to be forbidden for seven days after menstruation, is usually looked upon as a contradiction to this, it is not of much importance, because that religious command really reads differently from what is usually accepted—the period of seven days during which the woman is unclean begins with and not after menstruation. If now the menstrual flow lasts ordinarily five or six days, the period of abstinence for the male ends almost at the same time as does the flow. The great fruitfulness of this race, then, does not speak against, but positively for the coincidence of ovulation and menstruation. Further, the knowledge that among animals, the rut, the analogue of menstruation although not identical with it, occurs at exactly the same time as ovulation, must not remain unmentioned. Finally, the fact that according to the anatomical investigations above mentioned, the rupture of the Graafian follicles in the majority of cases must have occurred during or near the menstrual period causes the coincidence of the two processes to appear normal; the admittedly large number of exceptions may perhaps be explained in the following manner:

It is possible that ovulation does not always and in all individuals conform to a monthly type, as is shown perhaps in some women by the not infrequent intermenstrual pain or by a catarrhal secretion or slightly bloody discharge between two menstrual periods which persists for several days. Perhaps also the sexual act, so irregularly performed in the human species, may influence ovulation. While an animal is only impelled to cohabit during the rut, and the sexual appetite seems to be dormant outside of this period, the most varied sexual excitements of a psychical and bodily nature are constantly exerting their influence upon the woman. Shall these intense, repeated irritations of this kind remain without influence on the internal genitals — or, in other words, shall no congestion of these organs and its consequent ripening and rupture of the follicle be the result? Is it not possible that through this a modification of the type of ovulation may be brought about? In regard to menstruation there can be no doubt but that by the sudden change from abstinence to sexual intercourse, as we often see it among the newly-married, a change in the menstrual periods may be effected; is it not possible that this may often be the case with ovulation?

If now, taking all things into consideration, ovulation and menstruation have a causal relation to each other, and if the two processes do mostly occur at the same time and seldom separately, it is not said that both processes must under all circumstances always appear at the same time. We know positively that ovulation may occur without menstruation, as is proven by conception in those suffering from amenorrhœa, and we are justified in the supposition that the bloody periodical secretion does not always coincide with a follicular rupture.

CHAPTER VIII.

THE PRODUCTION OF SEMEN.

THE testicles are the principal male sexual organs; they give to the latter and also to the whole body their characteristic manner of growth, and produce the male portion of the elements necessary for the development of a new individual, the semen or sperma. Their first development from the embryonal sexual glands, as well as their external differences from the ovaries, have already been described when speaking of the physiology of the latter. The internal differences from the ovaries are brought about in the following way: While in the ovaries, the epithelium, covering the surface, grows and sends processes into the interior of the organ, which later on develop into ova and follicles, the same covering of the testicles remains passive; but here the canals of the neighboring Wolffian bodies penetrate the testicles and there give off the foundation of the permanent seminal canaliculi. The latter, in adults, form the principal part of the organ to which is allotted the task of preparing the semen. In respect of the latter function there exists a marked difference between the ovaries and testicles. The ova, the product of the first of these organs, are found in the embryonal rudiments nearly perfect, and when developed remain here until ovulation, so that the ovary appears less a place of production than a receptacle for the ova. It is different in the testicles. Until puberty, a product of the organ cannot be recognized, and only with sexual maturity do the spermatic cells appear in the seminal canaliculi. A further important difference is found in the following condition: It is not improbable that all of the ova for the whole period of sexual activity are contained in the primitive layer and that a new production does not occur in post-fœtal life; in the testicles there is a constant new formation of spermatozoa during the same period of life. This difference has a great significance in relation to sterility. The seminal canaliculi (the more exact description of which is here omitted) display as their contents in adults two kinds of cells: the so-called testicular cells, which have no characteristic markings, and which line the inner wall of the canals in childhood only. At puberty are added the so-called spermatic cells, also called spermatoblasts, which show altogether irregular forms, are held together by the formation of net-works, the meshes of which are quite small and contain the above-mentioned testicular cells and also the freed contents of the spermatic cells. As to the genetic relation of these two kinds of cells to each other, and even as to their physiological significance, there is no universally accepted belief. The different cell-forms, in all probability, indicate only different degrees of development of originally identical formations. Only this much is certain, that the spermatozoa are formed in cells. But whether these cells which produce spermatozoa are identical with the above-mentioned spermatic cells, or whether they are descendants of these and the latter only represent a kind of supporting tissue, is as yet uncertain. The formation of the semen seems to occur in the following manner:

On the above-mentioned cells, the spermatoblasts, which project in a lobular way from the walls into the lumen of the duct, thread-like outgrowths are formed, while in the cells themselves a vigorous nuclear segmentation takes place. These nuclear divisions develop into the head of the spermatozoa, which, by the formation of a central portion, are united to the thread-like outgrowths of the cells. The latter become elongated, project from the surface of the cell and are light-refracting; they are the caudal filaments of the spermatozoa. Finally the cell is destroyed and the spermatozoa are free. They are still united in bundles, or are, perhaps, to be seen separated in the interstices of the cellular net-work of the seminal canaliculi. These cell-derivatives, which we must discuss more fully, do not indeed alone form the semen, but they have added to them in their migration through the male passages the secretions of a number of glands. This secretion is furnished by the gland at the end of the vas deferens, the prostatic glands, the seminal vesicles and Cowper's glands. From the commingling of the spermatozoa and the secretions a fluid is formed, which is colorless, somewhat viscid, ropy, easily coagulable, imparts a peculiar odor, and is of an alkaline reaction; it is soluble in water and in acids, but is coagulated by alcohol.

The amount of semen ejaculated at each coition is extremely variable; age, bodily development, previous abstinence or excess, exert a marked influence upon the quantity and the proportion of morphological elements, therefore upon the quality. Usually the amount varies between twenty minims to one and a half drachms. The production of seminal fluid, which is probably under the influence of the centre of the male sexual function, which lies in the lumbar portion of the spinal cord, begins with the appearance of manhood, which occurs at about the same time as does puberty in the female. Until the thirteenth or fourteenth year the testicular secretion shows no spermatozoa, and for a short time after this only a few, which are undeveloped. After this the normal seminal production is established. In old age the seminal production is diminished and may entirely cease; there is no certain time at which this change occurs. In many weakly individuals or in those weakened by long-continued sickness, marasmus, or by sexual excesses, the sexual instinct, the subjective manifestation of the testicular function, may be abolished early, while in other individuals the seminal production, in contradistinction to the early and regular cessation of ovulation in women, as has already been proved (particularly by Casper, Dieu and Duplay, and in more recent times by Schlemmer), is preserved in old age. In the ejaculated semen, its characteristic elements, the spermatozoa, may be seen in an active condition. Still the seminal production in old age is the exception. Duplay could detect normal semen in only seven of fifty-one cases; in thirty not only was the number of spermatozoa lessened, but they were also altered in form; in fourteen, without any disease being shown, no spermatozoa were to be recognized.

If the semen is subjected to a microscopical investigation, there is only one morphologically component part recognizable, the previously mentioned seminal bodies (seminal filaments, zoosperms, spermatozoa), which arise from the cells of the testicles, and which determine the male agent, wherever propagation occurs by the commingling of two generative elements. They exhibit very different forms in the different animal classes; but in almost all classes it can be shown by great enlargement, but much more clearly by chemical reagents, that they consist of three parts, the head, central portion and tail, the origin of which from the spermatoblasts of the testicles we have just learned. In the human species, the head is the largest part; it is oval, slightly flattened; the central part is joined to the posterior part of the head, is much smaller than it, from which it is not sharply defined, and gradually grows smaller and passes over into the still smaller filiform tail part. It has been attempted to describe a particular structure in the interior of each part—in fact some have even claimed to have seen formations analogous to the abdominal organs, but this was soon shown to be a delusion. Still, a difference in the substance does exist, although it cannot be exactly shown. The length of a spermatozoon is about $\frac{1}{500}$ of an inch; the length of the head is equal to $\frac{1}{10}$ of the total length, or about $\frac{1}{5000}$ of an inch. According to the investigations of Schlemmer, other component parts of the semen are: epithelial cells and roundish, granular formations, characterized by nuclei or fatty granules. Still, in the normal semen, the spermatozoa are in the majority, as are for instance the red blood corpuscles in the blood, while the other formed elements are in the same proportion as are the colorless blood corpuscles in blood. As regards the chemical composition of the spermatozoa, the investigation of the testicular substance of fishes, which consists almost entirely of seminal elements, shows that they consist partly of an albuminous substance; they contain no mucin, but a considerable amount of protogon, lecithin or cerebrin. When reduced to ashes, the phosphates have principally disappeared.

The most marked peculiarity of these formations is their activity, which gives to them the appearance of living beings, and gave them the name of "Seminal animals." The power, which causes this locomotion, is peculiar to the protoplasm of many cells. The intensity of this power is very variable. In many classes it is hardly noticeable, in others it is only manifested by an amœboid change of form, and in others still it is very active and works a great change of locality of the whole spermatozoon. The manner of movement is also very variable; in the human species it consists of to-and-fro motions of the tail from one side to the other, and which movement is passively participated in by the central portion, and which results in the change of locality of the whole spermatozoon. The rapidity with which half of such a movement of the tail is made with undiminished vitality, is estimated by Hensen to be one-quarter of a second. The change of locality hereby occasioned, so far as the direction is concerned, is never a regular one; every spermatozoon moves forward exactly in that line to which the head is directed, so that the spermatozoa move about in the most varied way and in all directions. The direction is changed only when hindrances, such as epithelial cells, intervene. Often the obstacle is pushed to one side. According to Lott the forward movement is at the rate of $\frac{1}{7}$ of an inch per minute. Henle believes that a spermatozoon travels about $\frac{4}{5}$ of an inch in from seven to eight minutes.

The power of movement of the spermatozoa is notably influenced by different conditions. A certain degree of dilution of the testicular secretion, by the admixture of the secretions of the previously mentioned glands, seems necessary, since the spermatozoa taken directly from the testicles show no movement, although they move about in the inferior division of the vas deferens. Perhaps the closeness with which the spermatozoa are found in the testicles is the cause for the lack of movement. The duration of the power of movement of the spermatozoa, or, what perhaps amounts to the same thing, the duration of life, since with the cessation of movement, the destruction of the formation is inaugurated, at least its power of fructification is lost, is very variable. The spermatozoa may remain in the masculine sexual passages for months, without losing a particle of their vitality. They do not exist as long as this in the female sexual passages. While, according to different observations of the more highly organized animals, the spermatozoa are met with in a living condition in the various portions of the female genitals for eight days after their entrance (Bischoff, Prévost and Dumas; in bees, the sperma is preserved in the seminal receptacle more than three years), in the human species they have only been traced as high as the cavity of the cervix, and living filaments have only been observed as late as the seventh day. (Hausmann.) The movements are much more difficult to preserve outside of the animal organism. Still, the movements only cease with the advent of putrefaction, consequently after one or two days. Of great importance in the study of sterility are those investigations into the influences exerted by different reagents upon the movements of the spermatozoa. According to Mantegazza's investigations, the semen may be heated to 47° C. without arresting the movements of the spermatozoa; the temperature may also be lowered to 10° C. without impairment of their power of movement; in fact the cold seems to exert a conservative influence, since in semen treated in this way the spermatozoa showed signs of life six days afterward. If the spermatozoa are dried out through the abstraction of water by means of salts, the movements cease; by the addition of water, the power of movement is again restored. If too much water is added, the movements cease, only to be resumed upon the withdrawal of the water. In general, water is detrimental to the semen; if the semen of animals is deposited in water, the movements of the spermatozoa cease usually in a few minutes, but certainly in a few hours. Even the contact of the semen with urine is said to be detrimental; it is the same with those metallic salts to which the corrosive sublimate belongs (a solution of corrosive sublimate of a strength of $\frac{1}{10000}$ is sufficient). Acids at first accelerate the movements, but then cause them to cease forever, and alkalies in weak solution have the power to accelerate the movements. Organic poisons and neutral salts are without any influence. Engelmann, who, next to Kölliker, has carried out the greatest number of investigations of this kind, has arrived at the conclusion that every agent which is in a condition to restore the regular form and size of the dried or swollen spermatozoon is capable of causing the movement of the same.

CHAPTER IX.

THE TRANSMISSION OF THE SEMEN.—COHABITATION.

THE transmission of the semen from the male genitals into the female sexual organs occurs through the act of copulation, which is preceded and made possible by the occurrence of the so-called erection of the penis.

The erection is an occurrence dependent upon the centre of sexual activity. This centre, according to the investigations of Goltz, is to be sought in the lumbar portion of the spinal cord. It may be aroused to activity in manifold ways, but, above all, by means of irritations which proceed from the genitals themselves. This centre is already irritated by the production of semen and the consequent filling of the testicles with spermatozoa, and they are predisposed to the liberation by other irritations. Not only erection, but even spontaneous emission of semen, the so-called pollution, may occur in this way as the result of powerful excitement. This centre may also be influenced by pure mental activity (erotic ideas). The different organs of sense are also in a condition to take up in many ways irritations, and to transmit them to this centre. But the brain exerts a repressive influence. If the spinal cord in animals is divided above the lumbar portion, irritations of the genitals are responded to much more promptly and energetically by erections, as is also positively proven by clinical experiences in diseases of the brain, and in psychical disturbances. The irritation exerted upon the centre, as shown by Eckhard, is transmitted to the blood-vessels of the penis through the sacral nerves, and causes a marked dilatation of them. Through the great hyperæmia of the three spongy bodies (corpora cavernosa bulbi and corpus cavernosus urethræ) the male member is markedly enlarged, assumes a rigid condition, and is directed upwards: erection. This process is made possible, because a relaxation of the tonic contraction of the vessels, caused by the previously mentioned nervous influence, allows of a greater blood-supply, and coincidently by compression of the veins, the return flow of the blood from the spongy spaces is hindered. This hindrance to the return flow of blood is to a great extent to be attributed to a contraction of the striated muscular tissue, which surrounds the root of the penis, and is caused by this same nervous influence.

This change in the penis makes it possible for it to enter into the female genitals. But it is only after a further irritation, caused by these parts, that the transmission of the semen into the vagina occurs. This irritation is produced by the friction of the penis against the walls of the female genital canal. The irritation is carried to the centre of the sexual function from the whole surface of the penis, but principally from the very sensitive glans penis, chiefly by the pudic nerve, and thereby contractions of the spermatic ducts are inaugurated. Hereby the semen is moved forward in this canal, is further mixed with the secretions of the above-mentioned glands, and is forced through the ejaculatory duct into the urethra. At the same time, there also occurs, and probably with similar effect, a contraction of the dartos and cremasters. Then contractions of the muscular tissue, the prostatic and membranous portion of the urethra occur, which advance the semen, whereupon the rhythmic contractions of the bulbi-cavernous and ischio-cavernosi muscles follow whereby the semen is completely and forcibly ejaculated from the urethra into the vagina. The pushing movements of the penis, inaugurated after its introduction into the vagina, are probably not for the purpose of deeper penetration. They produce friction between the dorsal surface of the penis and the swollen clitoris, whereby the voluptuous sensations of both individuals are increased, and the secretions are more rapidly ejaculated: the secretion of the vulvar glands in the female, and the ejaculation of the semen in the male. As regards the part played in this act by the external female genitals, it is certain that the excretion of the vulvo-glandular secretion is without any physiological significance; on the contrary, I believe that the contraction of the constrictor cunni and perhaps also the anterior portion of the levator ani, which grasp the penetrating penis, is rightly so regarded, if we attribute to these muscles the function of binding organs. In apathetic women (of whom we shall speak later on), as well as in women who have repeatedly borne children, this contraction is only a partial one, and is in fact often entirely lacking, without the coition being thereby influenced.

CHAPTER X.

THE MIGRATION OF THE SPERMATOZOA.

THE views in regard to the transportation of the semen, from its emergence from the urethra to its entrance into the uterus, are very different. From lack of direct observation, as well as by the ambiguity of the results of investigations which have been instituted into the further advance of the semen, and from the greater or less value which one attaches to certain experiments upon animals, this divergence of opinion is easily understood, and great freedom is given to theoretical speculations. Two opinions are directly opposed to each other. According to one, the proper transportation of the semen is directly from the orifice of the male urethra into the external os uteri, which openings during cohabitation so approximate themselves, that not only do they correspond, but the elongated axis of the penis is identical with the vertical diameter of the cervix; the force, with which the ejaculation occurs, transmits the semen directly into the uterus. The vagina does not serve as a receptacle for the semen, but only, as its name indicates, as a canal through which the penis accomplishes its approach to the uterus. According to the other diametrically opposed view, the semen is simply delivered into the vagina, and the spermatozoa by their own peculiar movement bring about their transportation into the uterus. As in all cases, where extremes stand opposed to one another, so here there are intermediate views.

As regards the first view, it is an ideal one, which, in no way, corresponds with the truth. Aside from the fact that the anatomical structure of the genitals of a large number of animals would not permit of such a process of coition, there are many important considerations in the human species opposed to its unqualified acceptance. I would point to those not infrequent cases, which we must speak of later, where impregnation occurs without intromission, and where, therefore, the semen must undoubtedly traverse the long vaginal canal; if it be claimed for such cases that the seminal ejaculation occurs directly against the opening in the hymen, the ejaculation still lacks that force to so widely separate the walls of the vagina as to permit of its encountering directly the external os. Further, early in the marriage state in a great number of nulliparæ, conception occurs at a time when it is certain that the penis could not have penetrated deeply enough to have reached the highly-situated vaginal portion. Further, without taking into consideration the fact that from the position of the uterus, its axis is quite different from that of the vagina, so that on account of this condition, a direct injection into the cervical canal cannot occur, it is very improbable that two such small openings as the meatus urinarius and the os externum should meet each other with such certainty. But in women, who have already borne children, where, therefore, nothing prevents the deep penetration of the penis, even to the root, and where the relative patency of the os externum favors the taking up of the semen, the vaginal fornix is of such a width and often of such laxness that the glans is by no means compelled to approximate itself directly to the vaginal portion.

Seeing the improbability, nay more, the impossibility of such an occurrence, it became necessary to claim other factors as aids. In this way the uterus is made to encounter the virile member, and coincidently to assume such a position and relationship, that the respective canals lie in the same direction. Now, aside from the fact that we hardly dare suppose that the uterus would spontaneously descend as deeply as we would draw it down in operations, only by the exercise of great force, or that, for instance, the external os would seek that small gap which may remain open in a transverse obliteration of the vagina, it is hard to find a power which would occasion such a movement of the uterus. Now it is that the compression suffered by the anterior abdominal wall during coitus is introduced; but this pressure alone is not exerted directly upon the uterus, as is the case, for instance, in bi-manual examination, but can only influence the uterus by an increase of the intra-abdominal pressure, and therefore only in a minor degree; the influence of the abdominal pressure, which otherwise plays an important *rôle,* is excluded, since the respirations in the act of coition, in consequence of the sexual excitement, are not suspended, but are increased. The muscles of the uterus are absolutely incapable of forcing the uterus downward; only those muscles which are contained in the ligaments are in a condition to cause a change in its position. But if we picture to ourselves the direction of the action of these muscular fibres, we find that their power is not favorable to such a movement as we have just spoken of. The sacro-uterine ligaments draw the cervix upward and backward, and therefore place it in a position in which its axis is directly opposite to that of the penis; the ligamenta lata and rotunda, which undoubtedly draw the fundus of the uterus, elevated by pregnancy, downward, pass in the unimpregnated uterus lying in the pelvic inlet in a different direction. The first of these could, acting singly, only draw the uterus laterally toward the pelvic walls, while the action of both lateral ligaments would only serve to fix the uterus in the pelvic inlet, and the ligamenta rotunda would draw the fundus forward, and therefore would carry the external os out of the axis of the pelvis, and approximate it to the posterior pelvic wall. Thereby it is given an altogether improper position. After these there are only the longitudinal muscular fibres of the uterus remaining. These, according to the testimony of anatomists, are poorly developed; but their traction is certainly negatived by the coincident contraction of the more powerfully developed circular muscular fibres, the constrictor vaginæ superior of Sims. That the latter, probably, in connection with those muscular fibres contained in the uterine ligaments, are also capable of drawing the uterus downwards, can indeed be proved by the experiments made upon animals by Kehrer, Basch and Hofman, but certainly the power is not sufficient to cause such a physiologically productive descent, as is claimed for it theoretically; at least I consider it very improbable in those women who have not borne children. In such women, a somewhat more forcible expenditure of power is required to draw the uterus a short distance downward, even for diagnostic or therapeutic purposes; I can hardly believe that the tolerably weak muscular apparatus above mentioned is capable of a similar exertion of strength.

According to my opinion, the making of the proper inclination of the uterus dependent upon the filling of the bladder or rectum, is altogether inexcusable; a physiological act can certainly not be dependent upon such contingencies. Equally improbable and impossible is that theory advanced by Holst, that the semen is injected completely through the cervical canal into the uterine cavity itself. Even though the vagina and cervix lay in the same axis, the extreme narrowness of the cervical canal, its corrugated projections, and particularly the smallness of the internal os, would preclude the possibility of such an occurrence.

In support of this theory, a certain suctional power has been attributed to the uterus, which has been particularly emphasized by C. F. Eichstedt, and by which the entrance of the semen into the cervix is promoted. The muscular fibres of the uterus can certainly not exert this power, since, as has already been observed by Kiwisch, their contraction only empty the uterus of its contents, but cannot in any way perform the contrary task. For this reason this suctional power was ascribed to an over-distension of the blood-vessels occasioned by the sexual excitement, which was supposed to convert the uterine parietes, but particularly the cervix, into a kind of erectile tissue resembling the corpora cavernosa, a supposition which is particularly supported by the anatomical structure of these parts. According to Henle, the blood-vessels of the vaginal portion are so arranged and constructed that a condition simulating erection is easily possible. Hohl, Litzmann and Graily Hewitt, in touching the vaginal portion for the purpose of a gynecological examination in nervous and excitable women, have been made aware of a change in the external os, and a swelling of the whole vaginal portion, which probably were caused only by sexual excitement. Wernich has noticed similar conditions immediately after cohabitation. It should not be disputed, for a moment, that such changes of the genitals do appear during coitus, but it may rightfully be questioned whether such anatomical changes really serve any purpose in the onward movement of the semen. This result is supposed to be brought about, first, by an expulsion of the mucus from the cervical cavity; secondly, the semen is drawn up by the enlargement of the cervical cavity occasioned by the cessation of the congestion. The first is probable; the parietes are made thicker and firmer by the marked distension, the pressure in the cervical cavity is increased, and the mucus is driven downward through the external os, thereby freeing the canal of that obstacle. But it is somewhat different with the upward suction of the semen, which is supposed to occur with the cessation of the congestion. This, according to my view, would only be possible if the uterus were enclosed in an inflexible capsule; then, by withdrawal of the hyperæmia, since the whole cervix could not in this way be reduced to the smallest possible volume, a negative pressure would be occasioned in the cervical cavity. A regular formation of a cavity, as described by Ducellier, would indeed not occur, but probably whatever lay before the internal os, mucus and semen, would be drawn up into the canal. But these are not the physiological relations which exist. The parietes of the cervix, which have suffered a marked distension by the inordinate fullness of the blood-vessels, are, by the gradual subsidence of the hyperæmia, gradually drawn in towards the centre of the organ, and thereby the development of a negative pressure in the cervical cavity is prevented. The increased space occupied by the enlarged cervix is again filled by those neighboring tissues which were pressed together by its swelling. The cervix, enlarged by cohabitation, would conduct itself similarly to the corpus cavernosum urethræ of the male; here as there, we have a canal surrounded by cavernous tissue. If the cervix really possessed the power of suction, and if it could aspirate the semen, air must certainly enter into the urethra after the cessation of the erection of the penis, which certainly is not the case. If the semen deposited in front of the external os were not under a certain pressure, it would never be driven into the cervical canal. The most that we can admit, then, is that in consequence of these transient changes of the circulatory relations, the entrance of the semen is made easier by the removal of the cervical mucus; the advance of the semen must be accomplished by itself.

From the physician's standpoint, certain drawing movements are also mentioned, which the irritated vaginal portion causes the os uteri to perform. This appearance was noticed in a prolapsed uterus, where very frequently lacerations, caused by a previous birth, are to be seen, and in consequence of which the external os is badly torn, and the cervical mucous membrane seems to be everted. By gentle manipulations, as, for instance, in attempts at reposition, the lacerations are closed, the mucous membrane is drawn in and the external os again assumes its previous form. It is possible that these occurrences, from the rapidity and novelty of their appearance, have furnished the idea of drawing movements. I believe that too much value has been attached to this single observation. It is at least very remarkable that among the great number of cases of prolapsus uteri, this phenomenon has so seldom been observed.

From what has been said, it may be concluded that in nulliparæ the vaginal portion and the glans are seldom brought in contact, and that in women who have often borne children the two openings seldom correspond, and that a complete descensus uteri and a parallelism of the axes of both canals, likewise an upward suction of the semen from the side of the cervix, is highly improbable. There remains now nothing but the action of the muscular tissues of the vagina and the pelvic floor and the ejaculatory force of the penis. We will pass over the first; the latter is certainly no weak force, and is capable of dilating the lax and loosely together lying walls of the vagina for a short distance; but whether it is sufficient to force open the narrow and rigid cervical canal—and even if this does occur, the conditions must have been very favorable—is very doubtful.

There remains, therefore, as the principal factor in the advancement of the semen, nothing but the specific movements of the spermatozoa, which are only aided by the contraction of the vagina. The semen, deposited on any part of the vagina, traverses the vaginal canal by means of the same force which moves it forward in other parts of the genital tract, where the conditions are no more favorable. It is indeed true that the nearer the external os the deposit occurs, the more favorable are the prospects for its transmission into the uterus. But for this it requires a particular contrivance, as the poche copulatrice of Courty, not the receptaculum seminis of Beigel, in which apparatus the semen may collect, and into which the vaginal portion may dip for the purpose of taking up the semen. In the vaginal vault there exists no hollow space, but the anterior vaginal wall with the vaginal portion of the cervix lies directly upon the posterior vaginal wall. A very small quantity of semen carried into the upper part of the vagina is sufficient to moisten the corresponding surfaces of the vaginal canal. This may easily be proven by a simple experiment. By introducing without force by means of a delicate syringe, only a few drops of a staining fluid, for instance, India ink, into the upper portion of the vagina, it is easily seen, upon the careful introduction of the speculum, that the whole vaginal vault is stained thereby. All parts, with which the external os comes in contact, are of a blackish color. Although the seminal fluid is somewhat thick, its consistency is not such as to prevent its spreading in a similar manner after its ejaculation into the vaginal vault, and thus coming in contact with the external os. Therefore more than sufficient semen for the further advance through the cervical canal finds its way to the external os without any particular dispositions. In the normal condition of the cervix, the passage of the semen is accomplished by the same force which chiefly moved it forward in the vagina. The cervix is normal when its canal throughout its whole extent, but particularly at its two openings, shows a sufficient diameter; when the canal is not occluded by secretion, and when the latter is of the proper chemical reaction (weakly alkaline). Even for this part of the genital tract, auxiliary forces have been claimed in the transportation of the semen. It is claimed that the ejaculation not only propels the semen into the cervix, but also through its canal directly into the uterine cavity (J. v. Holst). Aside from the fact that it is highly improbable that this force can propel the semen into the cervical cavity, the arbor vitæ uterinæ would certainly hinder the accomplishment of this occurrence. A glance at the complicated structure of the cervix in the animal kingdom (in the pig, sheep, etc.), where the mucous membrane is disposed in markedly projecting folds and flaps, and offers the greatest obstacles to the onward movement of the semen, is in this respect very instructive; this arrangement, which repeats itself, although in a lesser form, in the human species, shows us that the semen must rely upon its own strength to pass through this canal. Peristaltic movements of the rigid walls of the human uterus are not to be thought of. The movements of the ciliated epithelium are undoubtedly directed toward the uterine cavity; they can aid the forward movement of the semen, but they cannot have a very important significance, since in the tubes the spermatozoa hasten toward the ova against the ciliary motion, and without being very much retarded by it. If we call to mind those pathological changes of the cervix which exclude all these auxiliary aids, and in spite of which conception occurs, we must admit that, in this portion more even than in the vagina, that quality of certain cells and their derivatives, which otherwise also plays such an important part in physiology and pathology, namely, the automatic change of locality, aids the transportation of the semen. After the semen has reached the uterine cavity, it does not meet with any arrangement, whereby its further transportation will be accomplished; here also the semen is relatively dependent upon its organized elements. This power of self-movement is so great, that the spermatozoa traverse the narrowest part of the genital tube, namely that portion of the tube which penetrates the wall of the uterus, in a tortuous manner, even against the ciliary motion of the epithelial cells, only to overcome in the middle portion of the Fallopian tube the opposing peristaltic movements, in order that they may reach the ovum awaiting impregnation. It is easily understood that all of the spermatozoa which are deposited in the vagina do not reach their goal, the ovum. Part of the semen follows the virile member upon its withdrawal. But even later a further portion of the fluid is lost, and so much the more so, as the closure of the genitals externally is too often extremely imperfect. But even with complete retention of the semen, only a small number of spermatozoa pass through the external os. For the latter, without will and without instinct, separate irregularly in all directions, so that only a small number come in direct contact with the external os. Another portion perhaps occasionally reaches the external os in a circuitous way, after it has encountered some obstacle on the walls of the vaginal vault; but it is certain that the greatest portion, exhausted by the prolonged fruitless movement, is destroyed in the vagina.

The narrowness of the cervical cavity should be favorable rather than unfavorable to the onward movement of the spermatozoa, although here again the folds certainly prevent a part from moving further. A great number of spermatozoa are certainly lost in the roomy uterine cavity, so that they never reach the extremely narrow tubal openings; and of those, which do penetrate into these tubes, half never attain their object, since usually only one ovum is to be found in a tube. In this way the number of the spermatozoa, in their long migrations and from the relatively short duration of life, must decrease in a rapidly increasing progression. But since, on the one hand, the number of spermatozoa is an enormous one, and on the other hand only a single spermatozoon is necessary for the impregnation of the ovum, and as it is perhaps probable that impregnation can only occur by the conjunction of a single spermatozoon with a single ovum, the ejaculated semen is, under proper conditions, efficient for conception. It is different, however, in those cases in which the distance is increased, the obstacles, greater and more numerous, the ejaculated semen small in quantity and containing but few spermatozoa; under these circumstances repeated cohabitations may remain fruitless.

CHAPTER XI.

INSEMINATION.—CONCEPTION.

BY impregnation or conception, we understand that intimate union and blending of the male and female creative elements (spermatozoon and ovum), whereby the ovum is made to undergo further development, and the result of which is the formation of a new individual. This act appears to occur in the human species in the first third of the tube; at least this is the case among animals; probably it occurs much less frequently in the uterus. The process consists in reality of the penetration of the ovum by only one spermatozoon, and the changes which are produced in the interior of the ovum by this penetration furnish the impulse for the formation of a new being. This process, however, is not so simple as has been supposed. Manifold changes of the egg precede the meeting of the two procreative elements. It is well known that among many animals, the process of segmentation has gone on to a certain degree in the ovary without previous impregnation, an occurrence which had always been thought to be dependent upon the penetration of the spermatozoa into the ovum. We know now, that at the approach of the semen, the blastodermic vesicle changes its location, moving from the interior to the surface of the yolk; that it divides here, throws out a part of its substance from the yolk while the remainder, as the so-called ovum nucleus, returns to its former position, whereby a change in the granular division and pigmentation of the yolk is produced. The entrance of the spermatozoa into the ovum is also accompanied by noteworthy appearances. Fol noticed, in sea-stars, that only one spermatozoon penetrated an ovum, and that as soon as this had occurred, a thickening of the enveloping membrane was instituted to prevent others from penetrating; should the latter occur, however, in some exceptional way, the process of development of the impregnated ovum is disturbed. It has also been proven (Neunangen) that the yolk sends out a projection towards the penetrating spermatozoon, with which it unites, whereupon the spermatozoon is enlarged, and converted into the so-called spermatic nucleus. It is also proven that the spermatozoon and blastodermic vesicle are blended with each other, and that the constituent parts of this new formation are formed in the nucleus of the germinative vesicles. These extremely complicated processes are indeed only known of certain animals, and naturally cannot be applied to the human ovum without further proof.

The impregnated ovum is carried into the uterine cavity by the motive powers already described. It finds the uterine cavity prepared for its reception, in that its mucous membrane is markedly swollen and is disposed in folds. This swelling of the mucous membrane is considered by many (Reichert) to be nothing more than a continuance of the hyperæmia occasioned by the previous menstruation, but this is very improbable, since the impregnation has occurred some time after the menstruation, and in the intermediate time a subsidence of the swelling must have taken place. It is much more probable that by the impregnation of an ovum, a renewed and intense congestion of the genitals is caused, which, in the short time necessary for the migration of the ovum into the uterine cavity, has already occasioned the swelling of the uterine mucous membrane and its disposal in folds. If the supposition that a portion of the mucous membrane is thrown off with each menstrual hemorrhage is true, and that a renewal of this portion is begun immediately after the hemorrhage, then the impregnated ovum would implant itself in the regenerated mucous membrane; then from the absence of ovulation, the exfoliation of the mucous membrane and the menstrual hemorrhage would not occur, and the decidual formation would proceed in the regular manner until toward the end of pregnancy, by its fatty degeneration, exfoliation and hemorrhage would again occur. Menstruation and parturition would then, to a certain degree, be identical processes. Let this be as it may, the impregnated ovum is always arrested upon its emergence from the tube, by the swollen mucous membrane. The irritation which it causes excites an increased growth in the mucous membrane, so that it lifts itself around the ovum like a wall; this increased growth makes more rapid advances than does the growth of the ovum, so that the upper borders of this wall of mucous membrane unite over the ovum, and shut it off completely from the uterine cavity. The ovum then appears to be completely imbedded in the substance of the mucous membrane. The further processes, which follow this implantation of the ovum, belong to another epoch of sexual life, pregnancy, which really begins with impregnation. But, since in the first few days of pregnancy, the discharge of the ovum is followed by no noteworthy disturbance, but is usually looked upon as a profuse menstrual flow, the condition of a woman, in whom these early abortions are constantly repeated, is almost the same as that of a sterile woman. And since the causes of these early abortions are usually the same as those which we recognize as the causes of sterility, we cannot interpose any objection from a practical standpoint if these early habitual abortions are looked upon as sterility.

CHAPTER XII.

STERILITY IN GENERAL.

WHEN we examine more thoroughly the sexual capability of the different animal classes, the most noteworthy fact that we encounter is that, in direct opposition to the human species, the foundation of a new individual is produced with a relatively small expenditure of strength and time. There is no small difference between the animal and human species in the promptness with which conception is caused by cohabitation. If we only consider here the more highly organized animals, we find that usually one cohabitation, at least at the time of the sexual excitement, the rut, is sufficient to cause impregnation. This is not the case usually in the human species, and this fact exerts a considerable influence upon its fruitfulness. If the usual belief that the sexual capabilities in women last as long as menstruation occurs, in other words, about thirty years, is correct, and if we accept eighteen months as the average duration of pregnancy, puerperium and lactation, then the number of a woman's parturitions is disproportionately small. In England, the average number of children to each marriage is 5.2; in Austria only 4. Certainly the sexual relations in the human species are different than in animals. Above all things, in the human species the first coition does not correspond with the appearance of puberty, but occurs later; further the marital procreation is very often terminated a long time before the climacteric period, by the death of the husband or by some other separation of the married parties. Among the marriages used for statistical purposes, many are included which have been terminated by the early death of the wife. Those frequent interruptions of pregnancy in the human species, which do not diminish the number of conceptions, but influence the number of normal parturitions, must also be taken into consideration in the estimation of the fertility of the married parties. Aside from the very weighty condition that civilization has many reasons for artificially checking married fruitfulness, there are remaining those numerous disturbances of health and those social relations in the human species which are so unfavorable to fruitfulness. But in spite of all these, the fruitfulness of the human species is, under altogether normal conditions and with the same or nearly the same duration of pregnancy, greatly less than that of animals. This is very plainly shown by the statistics, compiled in England, of eighty mothers of the poorer classes, who had married between the ages of fifteen and nineteen years, and whose marriage had lasted at least thirty-one years, and therefore during the whole period of fecundity. These fruitful wives had only averaged a little over nine children each. The number would certainly be much larger if the sexual intercourse was followed by immediate result. And though we do not accept the calculations just given as positive proof, since we may have doubts, and as I believe, rightfully, whether the period of sexual capability and menstruation are the same, we cannot so easily dispute the following argument. The frequent unfruitfulness of cohabitations, when we consider how extremely seldom immediately after marriage, where certainly the influence of artificial hindrances to conception may be almost entirely excluded, impregnation occurs, and the great number of menstrual epochs necessary for procreation, are most striking. According to Puesch, in five only of ten fruitful marriages did parturition occur before the end of the first year; in four at the end of the second year, and in one only at the end of the third year. According to Spencer Wells, in only four out of seven marriages did delivery occur inside of eighteen months. This proportion is more marked in a calculation of M. Duncan, based upon a larger number of cases. In only about one-sixth of all the cases did parturition occur before the lapse of the first year after marriage; in a little less than four-sixths in the second year of marriage. This view is approached by Sadler, who noticed that in about three-fourths of all the cases observed by him, parturition occurred one year after marriage. According to Ansell the proportions are more favorable, but even according to him, parturition in half the cases first occurs after the first year of marriage. He calculates the time between marriage and parturition to be sixteen months. All of these results correspond exactly with those experiences which can be derived from ordinary life. The immediate occurrence of conception then seems to be the rule among animals, the exception among the human species. This difference may have its foundation in the cumulation of different causes, although the attention, in more thorough investigations, is always directed to certain deviations in the structure and function of the genitals.

Among animals, in ordinary times, the sexual appetite is completely in abeyance; it is only awakened when the conditions for conception are particularly favorable. The sexual excitement in the female appears at the time of the rut; at a time when ovulation, a muco-sanguineous discharge, and the sexual instinct, occur coincidently. But this time is peculiarly fitted for the reception of the semen; the swelling of the external genitals and the vagina occasion a great expansiveness of these portions, and in consequence permit of an easier and deeper penetration of the male organ. The secretion, the analogue of the menstrual blood, shows an alkaline reaction, and is, from a veterinarian point of view, peculiarly serviceable for the preservation of the vitality of the semen. The cervical cavity, in distinction to the time outside of the rutting period, is markedly dilated by the swelling, and therefore favors the passage of the semen in a marked degree, a condition to which much value is attached by veterinary surgeons. The immediately recurring rut, which in animals (in the horse, as early as the eighth day) occurs immediately after delivery, also favors the recurrence of gravidity. It is only during or upon the accession of this rutting period, whether it is immediately before or after, that the female allows of cohabitation. Ovulation and cohabitation occur therefore at the same time.

In the human species, this is different. The sexual appetite is permanent in both sexes, and is not dependent upon occurrences in the generative organs. Cohabitation occurs irregularly, is performed at all times, and seldom occurs at the time of ovulation; in fact at the time at which the extrusion of ova takes place, which we must look upon as corresponding to the rut in animals, the menstrual period, cohabitation is most avoided. It is probable that the unfruitfulness of numerous marriages depends upon the fact that cohabitations do not correspond to ovulation. Perhaps certain other processes in the human male genitals are to be regarded differently than our knowledge of those same processes in animals would seem to indicate. That an ovum is extruded at each menstrual period in the human species has certainly not been anatomically proven as yet; it is probable, however, that the menstrual congestion may occasion the enlargement of a follicle, and bring about its advancement to the surface of the ovary, and that its dehiscence may follow at the next period, so that the possibility of conception may indeed extend to greater intervals than exactly four weeks. Single cases from Leopold's series of investigations at least favor this supposition. If, however, ovulation may occur at irregular intervals and is entirely independent of menstruation, as many at the present time are inclined to believe, then the result of coitus, particularly when this is seldom performed, is entirely fortuitous. Just as little do we know positively of the duration of the migration of the ovum through the tube and of the vitality of the semen. But if, however, the human ovum passes more rapidly through the tube, and human semen retains its vitality for a less time in the female genitals, than we know to be the case in certain animals, then the chances of the meeting of the two elements are still less.

With these conditions, temporarily so unfavorable to prompt conception, many local factors probably concur. In most of the more highly organized animals, the connection between the tube and ovary is a more intimate one than in the human species. In many animals the ovary is situated in a more or less closed capsule, which catches up the ovum extruded by the rupture of the follicle and transmits it into the tube, so that the latter at first sight proclaims itself the excretory duct of the ovary. In others the ovary lies in a fold or sulcus of the peritoneum, which only incompletely takes the place of the capsule mentioned above. The apparatus for the transportation of the ovum in the human species is only shared by a very few mammalia. In the place of the fold or sulcus, there appears a pocket, formed by the peritoneal fold which the ovary carries, and the anterior surface of the ovary and the ligamentum latum. According to the testimony of Henle, this pocket is the most incomplete of all in the human species. By means of this extremely defective arrangement, the ovum is compelled to traverse the open abdominal cavity, and is here exposed by many contingencies to the danger of a deviation from the path to its destination. For instance, every unfavorable movement of the intestines may remove the ovum from the abdominal opening of the tube, but if it is once removed from this opening, there is little probability, on account of the lack of automatic movement, of its ever again reaching it. Impregnated or unimpregnated, it is usually destroyed in the abdominal cavity. But admitting that theory, which declares that the ovum can be taken up by the above-described erection of the fimbriated end of the tube, to be correct, the pavilion of the tube can still cover only a portion of the surface of the ovary; if now a follicle ruptures at any other portion, the ovulation will be without result. Many other reasons could be cited, which would help to explain the delayed and infrequent occurrence of conception; for instance, in the newly-married, the incomplete sexual union occasioned by various mechanical causes; in pluriparæ, the unfavorable conditions of the external genitals for the proper retention of the semen, and the direction of the vagina, etc., causes which can hardly be taken into account when speaking of animals.

This delay in the prompt occurrence of conception after cohabitation cannot be regarded as sterility, since the fact that delayed occurrence of conception appears to be the rule forbids it being considered as pathological. We see that in the majority of marriages, after a shorter or longer time, the occurrence of conception terminates this period of fruitless cohabitations.

But what then do we understand by sterility? It is not an easy task to furnish a generally satisfactory definition of this abnormal condition.

Fertility is directly opposed to sterility. In a fruitful marriage, the relations should be such that immediately after marriage the epochs of conception, pregnancy and delivery should occur in a normal manner, and that these should be repeated without any lengthy interruptions throughout the whole period of generative capability of the wife, so that the unconscious purpose of the marriage is arrived at by a numerous progeny. In ordinary walks of life, we do not make such high demands on the marriage state. We satisfy ourselves with a few of the above-mentioned epochs of the ideal sexual capability—indeed, we speak of a fruitful marriage, if the procreative capability of the married pair is substantiated by a single delivery. It is unfruitful if this result is not achieved, and no descendants are produced. We could, indeed, speak of a sterility of the married state when fruit are born but are not viable; the marriage is then, as we may perhaps better express it, childless; the sexual union, so far as its design is concerned, has remained without result. The expressions "sterility" or "unfruitfulness," are, as a rule, not used in this wide sense of the word in medicine, but we understand by them that condition where, in the course of the whole married life, or at least during a great part of it, conception does not occur, or if it does occur, the impregnated ovum is not developed in the female organism. In this way, those women who suffer from habitual abortions, and who, in that wider, popular sense are said to be unfruitful, from a medical point of view cannot be classified as sterile. In this treatise, sterility will be spoken of in its narrower sense.

Sterility is not the same in all marriages, but presents itself in different forms, which are given particular designations. A marriage is primarily sterile, when conception does not occur from some ante-nuptial fault of the woman, as, for example, absence of the uterus—or when, at least, conception is rendered impossible by the occurrence of some disease at the commencement of married life—as, for instance, peritonitis as a result of gonorrhœa acquired at the first cohabitation; secondary or acquired, when in a hitherto fruitful marriage an intercurrent disease prevents the occurrence of conception. This may occur as a result of a not altogether normal puerperium. We speak of a temporary sterility when bodily or mental conditions prevent temporarily the occurrence of pregnancy. Sterility is absolute when in either one of the married pair there is a hindrance to conception, which cannot be done away with either by natural or artificial means. Relative sterility is spoken of when conception is not absolutely prevented, but is made more or less difficult, —as, for instance, by flexions of the uterus.

The term "relative sterility" is indeed used in an altogether different sense. Usually, we understand by it that condition where both of the parties have lived together in an unfruitful state, while both, either before or after this marriage, were capable of begetting children with other individuals. By others, a lesser degree of fertility is designated, relative sterility, for instance, marriages with only one child, or marriages where births occur at greatly prolonged intervals. Others designate acquired sterility as relative sterility. It would be advisable to employ the term "relative sterility" only in the above positive sense, the more so, as it shows a condition opposed to absolute sterility. We might speak of a sexual discord, or sexual disunion, when the married pair, separately regarded, are fertile, but with each other are not in a condition to beget children; and we may speak of "diminished fertility" when referring to those marriages with few children.

The unfruitfulness of marriage is occasioned by the sterility of one or both of the married pair. Here also the defect may be of different kinds, so that we may have to use different designations, which are in part identical with those above mentioned. In this way we speak of the temporary sterility of the male or the acquired sterility of the female, etc.

Although it is perhaps possible to establish in a satisfactory manner the perception of sterility, it is not infrequently very difficult to determine the exact condition in single cases. It is seldom possible to declare with absolute certainty that a marriage is sterile; it is only when we find a positive cause of sterility in one or both of the married pair, or when the woman has passed the climacteric period, that we can make such a positive assertion. Much more uncertain are we in our decision when we find in one of the married pair one or more causes of relative sterility, for, in such cases, conception is not impossible, but is only made more difficult. It depends then upon the greatness of the hindrance as to whether we can declare, immediately or only after the lapse of a long time, that the marriage is sterile. Still more difficult is the differentiation when we find only unimportant hindrances, or when, in fact, the causes of sterility are not to be found. We must not deny the procreative capabilities too quickly. The shorter the duration of the marriage, the sooner should we think that we are not dealing with any pathological hindrance, but only with the above-described unavailing attempts at cohabitation. But the longer the duration of this period the more probable is the supposition that we are dealing with actual sterility. To fix a definite number of years, after the lapse of which we may declare a marriage as sterile, seems to be an arbitrary proceeding, since we know that often after the lapse of many years, and without anything having been done, conception does occur. And still the fixing of such a time has a certain justification, which is based upon reliable statistics. M. Duncan and Ansell have investigated this subject in a great number (over 9000) of marriages, and have arrived at the following results. At the end of the second year of marriage, $\frac{7}{8}$ of all the women had already borne children, while in the third, and still more in the fourth year, the numbers decreased markedly; but after the fourth year of marriage only $\frac{1}{39}$ of all the women bore children. Of course these numbers have only a relative value, since the statistics include only those women who had borne one child, and did not extend to sterile women. They do not show us how many women remain sterile after a certain length of time. Still they do show how slight are the chances for descendants after the fourth year of marriage, and why we are justified in regarding a marriage as sterile after this time. For the acquired sterility, according to my idea, we have no limit of time based upon trustworthy figures. Howitz declares a woman to be sterile who, in the course of five years after a delivery or abortion, does not again conceive.

The difficulty in making a positive differentiation in single cases has as a consequence many disadvantages. Many statistical calculations, so far as they are based upon small numbers, and the experiences of single cases, are robbed of their value thereby. An opinion as to the sterility of a marriage should really not be given until after the dissolution of the same, but these cases are presented to physicians, as we well know, at a relatively early period of the sexually mature age. According to the complaints and wishes of those seeking aid, these cases are looked upon and accepted as sterile; that in this way doubt as to the etiology and therapeutics enters is self-evident. Great care must, therefore, be exercised in differentiation. But not only does scientific work, but also medical activity suffer, for instance forensic medicine, in that positiveness is lost in the estimate of single cases, which the reviewer so unwillingly misses. In diseases of the genitals also, where the occurrence of conception is not desired, because it may produce complications dangerous to life, an over-estimation of the hindrance to conception might be fatal. Different cases have shown me what severe blame that physician suffers, who, in the belief of the impossibility of conception, has allowed cohabitation without any qualification. In the great majority of cases, the physician does not indeed have to answer the question whether sterility exists or not. The interested married parties themselves, if, after the lapse of a certain time no descendants are produced, consider their union sterile, and, therefore, they seek medical advice and aid.

CHAPTER XIII.

ETIOLOGY OF STERILITY IN GENERAL.

WE have learned from the above description that procreation is a physiological process destined for the preservation of the race, which differs from those processes which serve for the preservation of the single individual, in that for its accomplishment the co-operation of two individuals is necessary. If we examine more closely those functions which concern each one of the two interested individuals, we find that they in reality have but little that is not characteristic of the functions of other organs. As here, we have there to deal with activity of glandular organs which produce certain elements, which are excreted by particular excretory ducts, then to be used for some certain purpose. As there, it is physico-chemical forces which are active in the performance of the sexual functions.

But just as little as the other glandular organs of the body can remain active when isolated, so is it possible for the generative organs to perform their task only when in vital connection with the whole body. Here as there the influence of the nervous system is a particularly important one. But as the entire body is markedly influenced by external forces, and manifests this influence in modifications of the functions of organs, so the sexual functions are in the same way interrupted by external influences. It is the same with those disturbances of the sexual capabilities to which the sterility of both of those parties participating in the act of generation may be accredited. As certain, even though often unimportant, anatomical changes of other organs appear to modify their functions in a marked manner, so purely local material disturbances are in a position to destroy the task of the generative organs. To positively adhere to the view that the most frequent cause of unfruitfulness is to be sought in defects and diseases of the genitals of different degrees, is, according to my opinion, perfectly justified. But to me there is no doubt but that through the nervous system and by constitutional disturbances, unfruitfulness, most markedly in males, may be occasioned. How this influence is exerted is as yet not always clear; whether the nervous influence and the general disturbance of nutrition alone are sufficient, or whether they make themselves felt by secondary diseases of the genital organs, is undoubtedly very often not to be determined, but it would be very unfair to deny this mode of origin of sterility. It is just as difficult to prove that certain factors of the external world can prevent the occurrence of conception. Whether this influence is exerted through the nervous system or through alteration of the bodily constitution, is probably more difficult to prove. It is only weighty arguments that compel us to allow this disturbing influence to be accountable.

According to this, the causes of sterility would have to be sought in local diseases, nervous influences and constitutional affections, and further in external influences. As undisputed as this proposition truly is, just so difficult is it on the other hand to fix the definite cause in the great majority of concrete cases. In no department probably of gynecology does such mystery pertain in respect to the etiological relations as in the study of sterility. I will revert to the reasons for this uncertainty in speaking of the diagnosis.

Endeavors to clear up the causes of sterility are not wanting; this has been attempted in many ways. One method that has been employed for this purpose is that of analogy, the comparison of similar conditions in other organisms. A great philosophical and partly also practical interest is offered to follow the sterility, as well as the disturbances of the process of procreation, beyond the human species into the plant and animal kingdoms.

As regards actual unfruitfulness, we do not know what the conditions are among those animals living in a wild and free natural state, nor have we any very definite knowledge derived from the observation of domesticated animals. It is only of those animals, the horse, cattle, etc., concerning whose regular reproduction we interest ourselves from reasons of economy, that we possess any, even though very uncertain experiences. Even these are narrowed down to confirming general causes, which underestimate fertility, or cause seeming sterility, or which retard fructescence. On the contrary, we lose countless exact observations of single cases; such sterile domesticated animals, because not actually sick, are seldom brought under the observation of the veterinary surgeon. On account of the further economical realization (fattening) they do not come under anatomical examination. Still, recent literature points to a few interesting observations concerning the sterility of domesticated animals, which are of great value in the explanation of human sterility. Theoretically valuable, but practically of little worth in the question of sterility, are those changes in fertility which occur in many animals and plants, as soon as certain influences, which manifest themselves gradually or suddenly, occur. The numerous experiments made in this matter have received a marked addition and philosophical elaboration in recent times. The Darwinian theory, which relies greatly upon these data for support, has added the most of these. The transformation of sexual life does not, however, consist always in a complete suspension of the procreative capability or a decrease of the same, but not infrequently even in an increase of fertility. The latter may be manifested in two ways, by an increase of the fruits themselves or by a more frequent occurrence of the period of reproduction. The change produced can also only consist in an improvement or deterioration of the descendants. The factors concerned in these changes can be of different kinds.

So we see that certain plants by a change of locality, probably on account of the changed surroundings, are not as fertile as formerly. The change in temperature, the climate, in fact, has a still greater influence. Here also, particularly with every change, events occur which are mostly detrimental to fertility, as is proven by the extremely numerous observations of plants and animals. In the same way changes in nutrition manifest themselves. While with a certain quality of the earth, the growth of the parts of a plant and its production of fruit remain in a proper relation to each other, the fruitfulness is very much diminished in favor of an excessive growth by an over-supply of manure. It is the same with animals, in whom over-feeding easily results in unfruitfulness. It is seldom that the opposite, an over-production, is caused. An unsuitable supply of food appears to have a similar effect, as the power of reproduction is diminished. A most striking influence upon the sexual capability is exerted by the change from a free state to one of subjection, as we see it in the confinement and taming of animals. The sexual powers are positively diminished; infrequent deliveries, abortions and even loss of the sexual instinct are the frequent results. But with other animals a marked increase of fertility is often brought about by taming. We also possess conclusions in regard to the influence of age upon the sexual functions, derived from observations made upon animals. From these it appears certain that advanced age as well as early youth are unfavorable to fruitfulness. This is particularly noticeable in the early youth of the mother animals. The investigations and experiments into the consequences of a sexual mixing of too closely related individuals, the so-called inbreeding, have shown an injury to the fertility in its wider sense. Much less certain is this among plants, than among animals, of whose descendants it may be proven that they suffer a diminution of the sexual power, in some cases even complete sterility, but most frequently there results a very unfavorable influence upon the bodily constitution. These consequences undoubtedly appear gradually in later generations. Here also belong those attempts that have been made to bring about a fruitful sexual union between two botanical or animal individuals, who, in respect to parentage and formation are widely separated. This is known as bastardizing. This latter occurs, as a rule, more readily, when two botanical or animal beings, closely related in respect to parentage, are brought into sexual union;

with much more difficulty, however, the more distantly related they are. Still there are many exceptions, in which again individuals closely related will not unite so far as procreation is concerned. As far as the destiny of these newly-produced individuals, formed from a sexual union of this kind, is concerned, they are less so among plants than among animals, weaker in their reproductive power—in fact they are very often absolutely unfruitful. This result finds in part its confirmation in the human species.

Exertions also have not been wanting to determine from statistics the existence of sterility. Still there are no statistics of the population of European countries that would as yet furnish us with any satisfactory explanation. Not even the frequency of sterility can be determined from the material at hand, because it is very seldom that childless marriages are investigated. But where this has been done, the material is not useful for the determination of the absolute sterility of the marriage. For many marriages, childless at the time of investigation, may have been fruitful previously, and the fruits have perished. The idea of a childless marriage does not include an unfruitful one. Still less we gather from statistics anything that will determine for us the etiological relations of sterile marriages.

On account of the lack of statistical material, which would include great numbers of people, and would cover a great period of time, the value of those opinions based upon the inhabitants of small territories is not to be under-estimated. By these investigations we can get a very fair idea of the frequency of unfruitful marriages; they prove that we do not go too far when we accept the proportion of sterile to fruitful marriages as 1:8. In respect of the sexual capability, as manifested by its products, the investigations furnish us with valuable information. As to the causes of sterility, we learn from these investigations of influences whose action upon fertility is reflected in statistical tables. The influence exerted by the age of the woman at the time of marriage is particularly marked. But as useful as these statistical investigations are in themselves, they are not sufficiently far-reaching to shed a clear light upon the existence of sterility, and the conclusions drawn from them are not as trustworthy as they at first appear. The fact that in the statistics of M. Duncan, the influence of the sterility of the male, which furnishes a relatively large percentage of the causes of the sterility of marriage, is included, decreases their value. It is only the sterility of the married state, and not the sterility of the female, that can be explained by them. It is more probable, however, that by the term sterility, M. Duncan would not have us understand what is usually understood by this term, but rather includes under this term conditions and occurrences which need not be in the slightest degree related to one another. According to M. Duncan almost everything that does not speak for fertility, is to be regarded as an expression of the sterility of the female. A woman, who has repeatedly aborted or had premature births, who has repeatedly given birth to dead or misshapen fruits, is afflicted with the same cause as the woman who never conceives. But further, a woman, who repeatedly bears twins or has given birth to a dozen children, suffers from abnormal fertility, which in its nature is very closely related to sterility, or is in fact identical with it. This arbitrary collection of totally different things, which certainly does not rest upon any logical necessity, robs M. Duncan's calculations of that value which is attributed to them by the author in his investigations into the causes of sterility. In the analysis of M. Duncan's tables, the purely local causes of sterility are not considered, and yet both anatomical and clinical experiences have shown us that they are not as infrequent as is supposed by M. Duncan. Their influence also is accredited to more general causes.. But even if the opinion of the preponderance of general causes were positively substantiated, a neglect of the local disturbances in theory and practice would not be justified. For the first, in order that they exert their influence, require the interposition of the latter. To cite only one instance, the sterility which, according to a law derived by M. Duncan from statistics, is very frequent in females who enter the marriage state between the ages of fifteen and twenty, can only be explained by those changes in the still incompletely developed genitals caused by cohabitation. It is also very probable that constitutional diseases manifest their influence in the causation of sterility only by the production of local alterations.

But in spite of all this these statistics are entitled, as much as analogous conditions in the animal and plant worlds, to a high value. They remind us that, in the estimation of the causes of sterility, we should not confine ourselves to local disturbances, but should search for them also in constitutional conditions, which again are very often produced by external influences.

It is strange that we so seldom pursue the path which most certainly leads to the explanation of the etiological relations of the diseases, and that we have not attempted to determine the causes of sterility by anatomical investigation. In fact until recent times the part played by pathological anatomy in this respect has been a very unimportant one. This is easily explained.

Above all things at autopsies there is not that desirable attention paid to the female genital organs, which are deeply buried in the pelvis, while the male genitals are, as a rule, absolutely unheeded; it is on this account that a great number of anatomical lesions that occasion sterility do not appear very noteworthy, and that the investigation of the genital parts for causes of sterility belongs to the more subtle propositions. Further, unfruitfulness is an affection that does not lead to death. If a sterile person dies, the autopsy is only made on account of the intercurrent disease which has caused death. The conditions found at the autopsy are often misleading; they must be judged with great care, for many previously existing lesions may disappear at the climacteric period, or anatomical changes then for the first time appear which may seem to have existed previously as causes of sterility, and may lead to false explanations. Systematic investigations upon corpses directed to the consideration of the causes of sterility, are, therefore, somewhat questionable, because they are usually made upon persons whose sexual capability during married life is unknown. The relation between anatomical change and physiological can by no means be determined with any great certainty from this material. Still such investigations, as those conducted by Winckel in 150 cases, and by Beigel in 600 cases, for the discovery of the causes of sterility in the female, are very valuable, even though they serve only to show the great variety and equal implication of the whole female genital tract in the anatomical causes of sterility. Of still greater importance are those investigations of the male genitals, which have been conducted chiefly by A. Schlemmer and A. Busch with such admirable results.

Notwithstanding the surprising results in the explanation of the causes of disease derived from experimental pathology, it is noteworthy that as yet no attempt has been made to solve the question of the causes of sterility by experiments upon animals. Many of the mechanical hindrances could probably be easily produced, and their influence, on account of the ease with which copulation can be regulated, could easily be proven. Up to the present time only a few such experiments have been made, and these have only an indirect bearing upon the study of sterility.

The study of the unfruitfulness of both sexes rests principally upon the broad foundation of clinical observation and experience, though this basis is not to be regarded as a very certain one, and we will later on, when speaking of the diagnosis and therapeutics, learn why too much dependence cannot be placed on such material. With this uncertainty, a searching, sceptical investigation is doubly called for.

We have already shown how markedly the fertility of plants and animals may be influenced by external influences, either natural or artificial. This change is, as we have seen, a varied one; it consists partly of a diminution of the fertility, which may be increased to absolute sterility. The human species is no exception, as it too is subject to the influences of the external world. As by long-continued influences a gradual change is effected upon large bodies of people, so may unfavorable external factors, which act more suddenly and in a more violent manner upon individuals, exert a weakening or disease-producing action upon the bodily constitution. The bodily constitution altered in this manner, is then again predisposed to exert a harmful influence upon the structure and function of single organs. In this way—weakening of the constitution and diseases of organs—certain external influences act upon the procreative capability.

But surely this action is exerted in the human species in a lessened degree. Of the external influences mentioned above, which act in such an unfavorable manner upon the fertility of plant and animal organisms, many are not to be taken into consideration when speaking of the human species; I point only to the arbitrary coupling. To others the human species seems to accommodate itself, or at least to successfully shield itself from them, so that external cosmic influences, particularly in respect to sexual relations, are not in a condition to affect it except in a lesser degree. Opposed to this in the human species, in contradistinction to other organisms, there is present another factor, which certainly acts more powerfully than the cosmic influences, namely, civilization. Our social conditions are not without influence upon fertility, and are certainly in their consequences often causes of unfruitfulness.

Less often does it occur that the reason for married sterility is to be sought in different defects of both of the married pair, but in the majority of cases this is dependent upon the procreative incapability of one or the other of the married pair. The causes of sterility are, however, different in the two sexes, and require hence a separate description. I will, therefore, first speak of the causes of unfruitfulness in the female, which are surely the most important, and will afterwards speak of the causes in the male. In speaking of the causes of sterility in the female, I shall use the division repeatedly emphasized; but when speaking of the male, for practical reasons, I will depart from that division.

CHAPTER XIV.

GENERAL CAUSES OF STERILITY.

ATTENTION has already been called to the belief in the minds of physicians, as well as in the minds of the laity, that there exists a series of causes of sterility that rest upon cosmic or social relations. They do not consist in definite defects of both of the married pair; the man as well as the woman is capable of procreation, but the influence of external powers hinders the fertility of the marriage union. These powers cannot be passed over in speaking of the causes of sterility, but must be considered for what they are worth as hindrances to conception.

Influence of Temperature and Climate.—We have already seen how greatly the fertility of plants and animals may be diminished or even absolutely terminated, by a change of locality, particularly when there is a coincident transplantation to a markedly higher or lower temperature. Do the same powers act in the same way upon the human species? That temperature and climate influence the sexual functions, may be proven by our experiences in respect to menstruation. There can be no doubt but that the latter appears much earlier in hot than in cold climates. Whether other deviations in this function occur under the influence of different celestial forces is not known with certainty. Fertility in the different zones does not appear to be influenced by the action of heat or cold. Practically it is important whether a change of climate has any influence on the fertility of individuals. There are too few facts known about this. Even English physicians, who, on account of the settlement of their own people in the most distant lands, are in a better condition to answer this question, cannot furnish us with any trustworthy conclusions. This question must, therefore, be considered as open.

Marriage of Blood-relations.—We have before drawn attention to the evil consequences of inbreeding in animals, the first signs of deterioration being a diminished fruitfulness. Does the same thing occur when the intermarriage of blood-relations is practised by human beings? What effect does it have on fecundity, and what results does it entail upon the succeeding generations?

As regards the first we must not forget that marriage does not take place between parents and children, or brothers and sisters, though inbreeding as close as this is common among animals. Nor is infecundity a consequence thereof among them. Recorded cases of incest in human beings have been followed by conception. Many evils have been attributed to the intermarriage of blood-relations, one step further removed, such as that of first cousins, of uncle or aunt with niece or nephew; it may be a question whether fecundity is lessened thereby, but I have certainly never observed absolute sterility in consequence.

Among others A. H. Huth has especially combatted the idea that such marriages entail sterility and other evil consequences. He is in error, however, in believing that statistics afford us no reliable information upon the subject; Mantegazza's collection certainly shows the harmlessness of such connections. He found only eight to nine cases of sterility in 512 cases of marriage between blood-relations, but he forgets that the same proportion of ordinary marriages are sterile, and holds that these figures militate against such connections. G. Darwin found 14 sterile among 97 marriages between first cousins, and 33 sterile among 217 marriages between non-related persons; about the same percentage. Thus marriage between blood-relations does not seem to interfere with conception.

It is, however, somewhat different as regards the progeny of these unions. Stress has been laid upon the fact that some ancient races have died out from close intermarriage. We have no proof of it, but the frequency with which prominent families, whose genealogies are well known, become extinct, would seem to render the question worthy of consideration.

Continuous intermarriage is common among the aristocracy of our towns, and the country gentry; it is the rule in certain isolated communities, and in some societies the members of which are closely bound together by economic or religious ties. A. Voisin denies that this leads to either physical or mental depreciation; and as a rule the children of such marriages do not again intermarry with those near of kin. Thus, as with animals, the evils of inbreeding are soon neutralized by cross-breeding. G. Darwin has proved statistically the harmlessness of marriage between cousins, and has demonstrated the fertility of such unions.

Bastard Marriages. We have seen the evil consequences of miscegenation among animals, and have noticed that like results occur when human beings of different races intermarry. The union of Teutonic whites with negroes gives us mulattoes; the union of Romanic whites with Indians or Malays gives us Mestizos. Difference of race certainly forms no obstacle to conception. It is difficult to decide whether fecundity is impaired thereby, since the half-breeds are mostly of illegitimate origin, and the fruitfulness of the occasional and unstable unions which originate from them cannot be compared with that of regular and permanent sexual union. Nor can we say much with certainty as to the fecundity of the offspring of such unions, for they intermarry, as a rule, with the full-blooded races, and so neutralize any ill effects which may be present. Unions between whites and negroes or Indians seem to be much more fruitful than those between whites and Australians; sterility and physical deformity appearing to be common results in the latter case. Undoubtedly social and religious relations hinder the propagation of the bastard or mixed races. But the impression remains that human miscegenation has but little effect upon fecundity.

Want of Sexual Unity.—The term "relative sterility," by which this condition was formerly known, has come to mean something entirely different, and the above designation seems to us to be preferable. It plays an important part in popular estimation and in popular medical writings. By it is meant the condition in which long and regular cohabitation between two individuals remains without result, though each one can procreate with other individuals. Marriages which have long been sterile are pointed out, in which after their dissolution both man and woman have produced children in another marriage. This is supposed to prove that the conjugation of two otherwise perfectly healthy persons may result in the neutralization of the power of propagation. Aristotle even promulgated a theory to account for this relative sterility, and it found a skillful advocate in Virey, who ascribes the failure to a want of "harmonie d'amour." Haller saw in the same fault the cause of many a sterile marriage. But one need not even be a physician to recognize the existence of the multitude of unhappy and yet fruitful marriages which every day occur, and which effectually disprove any such theory. Others believe that incompatibility of temperament among the parents hinders conception, but the experiences of ordinary marriages show this view to be untenable. Finally, the experience of the gynecologists shows that differences in the amount of sexual passion are of no account. To this subject we will return later.

The theory which seeks to explain relative sterility by a difference in age between the conjugating parties is more plausible. If, however, this difference is extreme, the man must either be very old, or the woman be near the climacteric, and the sterility may well be ascribed to the virtual impotence of one or the other party.

It has been pointed out that a soil which will grow one kind of grain may be entirely unsuitable for another kind, but we are dealing here not with different species, but simply with different individuals of one and the same species. Breeders of horses, cows, swine, dogs, doves, and other animals, have made observations similar to those seen in human beings. We may well claim that it is probably but very seldom that the conditions are such as to permit us to assume the existence of relative sterility. Only when, after many years of sterile married life, the parties marry other individuals and reproduce, can we assume its existence with any degree of certainty. Though it is claimed that such cases are of frequent occurrence, I can recollect none, and even if I could, it would be necessary to obtain exact date as to the conditions of sexual congress in the first marriage, before hazarding an opinion.

If I am not mistaken, the lay opinion as to relative sterility is based upon another and more frequent experience. I mean cases where pregnancy occurs after a long fruitless marriage, and is ascribed to the illegal influence of a third person, to whom perhaps the child that is born bears a striking resemblance. It is very evident here, however, that male sterility has been the cause of the infecundity. Such cases, and those of childless widows, whose second marriage has been fruitful, are, therefore, indecisive, as the following example will show:

Mrs. K., twenty-eight years old, married for the second time eight months ago. First marriage lasted five years, and was sterile. She consulted me as to her prospects of offspring, and examination revealed nothing abnormal. Four months later she conceived. Careful questioning revealed the fact that her first husband, though apparently healthy, had for years fulfilled his marital duties but very rarely and insufficiently. He died of a rapid phthisis. Here without doubt there was an absolute sterility of the first husband.

Of even less value are the cases where a new and sterile marriage follows a former fruitful one; advancing age, and acquired hindrances to conception playing an important part. The marriage of Napoleon with Josephine is often cited as an example of relative sterility. She had children by her first marriage with Beauharnais, and none by Napoleon, and the latter had a child from his subsequent marriage to Maria Louisa. This only shows, however, that Josephine, thirty-five years old, entered upon her second marriage in a state of acquired sterility. The following case is a striking one of this kind:

Mrs. L., thirty-nine years old, since fifteen years in second sterile marriage. First marriage lasted three years; one difficult delivery. Present husband had several children in his first marriage. The cause of the unfruitfulness was found in the woman; there were masses of exudation in Douglas's pouch, which fixed the uterus posteriorly, and enclosed the ovaries. She had had peritonitis after her childbirth.

But though many cases of relative sterility will not bear close investigation, and turn out to be absolute sterility on the part of husband or wife, the possibility of the occurrence of the condition cannot be denied. The conjugation necessary to conception may be an imperfect one between any two individuals. In rare cases this may be due to imperfect cohabitation; as in the case related by a French author, where a stranger impregnated the woman by practising coitus in an unusual position. More commonly we must look at some impossibility of mixture of the elements of conception to explain the sterility. Marriages between blood-relations have been cited in this connection, but not very happily, since the sterility is only seen in the descendants of such marriages. It is then due to constitutional degeneration, and cannot be referred to what we understand as relative sterility.

Much worthier of consideration is Mayrhofer's supposition, that the penetrating power of the zoosperms, and the resistance of the envelope of the ovum, may vary in different individuals. He bases his opinion upon Schenk's experiments upon the fructification of the mammalian ovum outside the mother, who found that the layer of cells originating from the discus oophorus and surrounding the egg, though apparently of like size and equally developed, might in one specimen permit the spermatozoa to reach the zona pellucida, and in another prevent their passage. The attempts at artificial bastard impregnation in batrachians and fishes, often difficult or impossible, have a bearing here.

It should always be remembered that cases of human sterility due to sexual disharmony are exceedingly rare, and that most cases supposed to be of this nature can be otherwise explained.

CHAPTER XV.

THE CONSTITUTIONAL CAUSES OF FEMALE STERILITY.

A NUMBER of general conditions, mostly pathological in their nature, may exercise a relative influence upon the fecundity of a woman, and impair her capabilities of conception. They most generally cause local disturbances in the sexual sphere, though the exact mode in which they do so is often by no means clear. The simplest way would be by nervous influence, but it has not yet been satisfactorily proven. On the other hand experience teaches us that general diseases cause disturbances in nutrition and function of the sexual organs. A case recently reported by M. Hofmeier is important here. A strong girl twenty years of age, who had formerly menstruated quite regularly, ceased to do so entirely, and became affected with pruritus of the external genitals. A careful examination revealed diabetes mellitus as the cause of the genital affection, and atrophy of the ovaries was found. Evidently, ovarian atrophy followed the general disease, and amenorrhœa and sterility then set in.

In other cases the sexual organs, and especially the ovaries, take part in the general constitutional disease, but are masked by its other phenomena. The results of C. Jani's observations in pulmonary tuberculosis favor this view. Though there were no external changes apparent in the testicles of patients of this kind, characteristic tubercle bacilli were found there. It is true we have as yet no positive information as to the occurrence of bacillary invasion of the ovaries, but the researches of J. Strauss, and Ch. Chamberlain would render it probable that that organ does not enjoy any special immunity. It does not seem improbable that the presence of parasitic organisms may cause disturbances of function.

It is certainly possible to have the function of the sexual apparatus interfered with without an actual lesion in other diseases. Thus I have been able to prove that the ovaries were entirely normal in sterile chlorotic women, and excessively fat women suffering from amenorrhœa, the general disease preventing local congestion and rupture of the follicle, and menstruation returning when this general condition was improved.

But sterility may be dependent upon the general condition in other ways. As we shall see below, it is very probable that morphological changes in the spermatozoa play a part in the development of male spermatorrhœa, possibly in connection with changes in that organism as yet invisible to us. Might not the female generative element, the ovum, be subject to the same changes? We have lately learned that many chronic as well as acute diseases are dependent upon the life activity of various micro-organisms, which might easily penetrate the tissues of the ovum, and injure it. This will be difficult to prove, since the ovum cannot, like the semen, be obtained from the living woman, but further microscopic examination of the ovaries after operations and autopsies may enlighten us upon the subject. We may assume it to be possible for ovulation to be perfectly normal, and yet the ovum be affected by structural changes sufficiently to render it useless for reproductive purposes.

Influence of Age.—It seems to be the fact that extreme youth or age on the part of the woman at the time of marriage does have an unfavorable influence upon her fertility. The statistical tables which M. Duncan has compiled from the reports of Edinburgh and Glasgow plainly show that many more women, relatively, that marry between the ages of fifteen and twenty, are sterile, than is the case with those who marry between the twentieth and twenty-fifth years. Not only the number of cases of sterility, but also the length of time ensuing between marriage and conception show this plainly. Whitehead calculated that while among 541 women who married in their twenty-second year, childbirth occurred on the average at eleven and a half months, it was much retarded in the case of those who married earlier. Again, in his second class (marrying between twenty to twenty-five years) among 1835 cases 1661 gave birth to a child within the first two years of married life, while in the first class (marrying between fifteen to twenty years) only 306 out of 700 women had borne a child in the like time. Pfankuch found that women who marry before their twentieth year bear their first child on the average half a year later than do those who marry after that time, the average time being twenty-six and twenty months. This is a considerable difference, and demands an anatomical explanation.

The genitals are not fully developed at puberty, and the uterus especially is not of full size until the twenty-first year. If now it is somewhat backward, it may well be that it is yet unfit for the reception of the ovum. And it is very certain that the earlier menstrual congestions lead simply to enlargement of the Graafian follicles, the later ones only causing a dehiscence. These two causes, incomplete development of the uterus and of the ovarian follicles, will indeed explain the retarded conception, but they will not account for the complete sterility which is so frequently seen. It may possibly be that the want of proportion between the membrum virile and the imperfectly developed female genitals, may set up catarrhal and inflammatory changes in these organs and neighboring parts, which may lead to permanent obstacles to conception.

In this connection it is well to note that cattle-breeders and veterinarians have long known that if young cows are permitted to become pregnant as soon as the rut appears, their further development is checked, they become weak and sickly, and especially, they lose the power of reproduction early.

In the same manner it may be statistically proven that female fruitfulness, which reaches its highest point at from the twentieth to the twenty-fifth year, decreases after that time and diminishes rapidly as the climacteric is approached. The fact that the number of births diminishes as the fortieth year is reached is no proof, and women who marry late in life as a rule marry elderly men, whose capacity for procreation is doubtful. But even when there is no disproportion as to age, sterility in women who marry late is relatively very frequent, and it has been claimed with considerable show of evidence that ovulation ceases in very many women at the fortieth year, though the menstrual hemorrhages may persist from habit for years, until the real menopause is reached.

The rule holds good in women as in animals. Advanced age is unfavorable to fecundity, and sterile marriages are very common under these circumstances.

Abnormal Sexual Sensations.—Irregularities in the nervous phenomena which regularly accompany female sexual life, have been frequently pointed out as causes of sterility. Our opinions will vary as we regard these sensations as necessary factors in cohabitation, or as unimportant accompaniments of the act. We can distinguish three varieties of sexual feelings—sexual desire, sexual pleasure, and sexual satisfaction. These may be irregular either from deficiency or from excess. The following conclusions are based upon most reliable statements from married men, and from facts furnished by women as far removed from frivolity as from prudery.

Not infrequently we find in women a deficiency or absence of sexual desire (*appétit vénérien*), and a partial or complete absence of pleasurable sensations during intercourse. Some women have no more sexual desires than have children. The influence of relatives, custom, and example, induce them to marry, and they regard the state as one of friendship at the most. They do not enjoy sexual intercourse—they submit to it as a duty, and they cannot comprehend the pleasure which their female friends find therein. Or again, desire may be absent, but a small amount of pleasurable sensation be developed intra coitum. In others the sensations are present in small degree at first, but they soon diminish after repeated childbirths, and have ceased long before the climacterium. In some cases a single even normal delivery suffices to destroy all feeling. Rarely the capacity to enjoy intercourse is abrogated by gravidity; I have met with but a single case. And it is not uncommonly observed that while there may be great sexual excitement during intercourse, the woman experiences none of the feelings of satisfaction.

I do not share the opinion that sexual passion is awakened in women only by the first cohabitation, and progressively increases, though this idea has been promulgated to explain late conception. It may possibly occur in very young newly-married people, and the idea has probably arisen from the unskillful manipulation and the injuries incidental to a first intercourse.

But the want of sexual feeling may amount to an actual repugnance to the act, and the pleasurable sensations be replaced by discomfort and annoyance or actual pain. In this latter case we must not lose sight of the fact that sexual diseases or a disproportion between the membrum virile and the female parts, or both, may be present.

Imperfectly developed sexual sensations may, as is well known, be heightened by external and psychical stimuli, but periodic changes between normal sensation and absolute want of it must be extremely rare.

This abnormal state of sensibility has been called dyspareunia, and is very frequent in its various forms and grades. It is a frequent cause of discontent on the part of the man and of jealousy on the part of the woman. They not infrequently call upon the physician for aid.

Nevertheless there is hardly any anatomical basis at all for this very common condition, and though I have always carefully examined the organs concerned in the sexual feelings, I have never been able to detect any abnormality of the ovaries, and have only twice seen a distinct atrophy of the clitoris. Nor have I been able to prove the existence of any of the numerous other causes of this "frigidité," which have been described especially in French literature. Of course, general diseases, like chlorosis, and maladies of the sexual organs, may diminish sexual desire, and so may excesses in venery, and especially masturbation. But if we are not unbelieving enough to be unjust, we will find that in most of these cases none of the above-mentioned causes will be present. Nor do I believe that the condition has been induced in psychic ways by education and training, for it occurs among uncultured peasants. It certainly has no connection with hysteria. I cannot decide whether heredity has anything to do with it. Whether advancing civilization has anything to do with its development, we cannot say so long as we do not know the frequency of its occurrence among savages.

We are especially interested here in the relations of this condition to sterility. I have found it but rarely, and on the other hand have seen an excessive proportion of rapidly succeeding pregnancies. I do not think that the absence of sensation has much influence upon conception at all.

Many physiologists and gynecologists, however, do not agree with me, and believe that sexual desire and passion, being present in most cases, are essential to the propagation of the race. Tilt and Duncan especially, regard it as a frequent cause of sterility. But sterile women who have no sexual passion seek medical aid much more quickly than do others in like condition, and even to laymen it seems a very plausible explanation of infecundity. If we extend our inquiries beyond those patients who come to us for sterility, and question our gynecological and obstetric patients and their husbands, we will find that dyspareunia is not only extremely common, but is very frequently found in fecund women. And on the other hand we usually find in sterile women other abnormalities of the genitals which would explain that condition. Leopold Meyer found want of voluptas frequently in these cases, but always also some other deficiency. I do not lay much stress upon dyspareunia or frigidity as a cause of sterility.

Others claim that heightened sexual appetite, with too frequent and stormy cohabitation, causes sterility. It is difficult to say how much basis there is for this view. The physician can obtain less frequent and less reliable data about it than about dyspareunia. I cannot tell whether the increased desire is very common in sterile women, and whether it is not much more frequent in fecund women. If we exclude those cases in which from male weakness the act is unsatisfactory, and also those cases in which the heightened orgasm is merely the expression of some mental disturbance, it is a question whether the few remaining cases cannot be referred to some genital disease, which at the same time causes sterility. Some years ago an exquisite case of this kind came under my observation. The girl was twenty-two years old, and of very excellent family. Excessive sexual appetite caused her to lead a very loose life and commit many follies. Examination showed that both ovaries were greatly enlarged, and fixed in Douglas's *cul-de-sac* by dense exudation. The anamnesis showed that the local malady was the primary, and the excessive sensuality the secondary affection.

I have observed certain cases which reveal the possibility of sterility occurring from repeated abortion due to too frequent and to over-vehement cohabitation. Physicians who practise much among prostitutes agree that the frequent occurrence of menses several days late, with abundant hemorrhage, are to be regarded as instances of abortion. There can be no doubt that such habitual abortions must lead to further changes in the genitals, which must finally lead to true sterility.

Masturbation has been claimed to have great influence upon fecundity. Here also we have no data; for but few repentant souls will confess it. Our impression, however, is that perhaps the unnatural satisfaction of the sexual appetite before marriage may injure the legitimate sexual satisfaction later, but we do not believe that it can ever really cause sterility.

Nervous Influences.—It has been assumed that sterility can occur from purely nervous causes. Psychic emotions are supposed to be especially hurtful to ovulation. It is undoubted that menstruation may be stopped for a longer or shorter time, or rarely, for ever in this way. And since we cannot as yet reject the idea of a connection between menstruation and ovulation, the possibility of sterility occurring in this way cannot be confidently denied. But here also our data are too few for us to have a decided opinion. The influence of nervous disease proper upon the function has not yet been investigated. It appears to me that none such exists, though I have no experience in the matter save in the case of hysteria. This latter malady occurs so frequently in connection with genital diseases, that it is almost impossible to decide upon its relation to sterility.

Dysmenorrhœa has been lately claimed to be an important cause of sterility, especially by the English physicians. Especially is the spasmodic form, when severe, supposed to be efficacious. It is not clear in exactly what way dysmenorrhœa is supposed to exercise an influence upon ovulation. We must assume that the uterine contractions which cause so much pain during menstruation, must occur during cohabitation, and either the entrance of semen be prevented by spasm of the cervical canal, or, if it has already entered it must again be expressed.

It is true that this theory would at once explain the occurrence of sterility in a large number of cases where no other abnormality is present. Dysmenorrhœa is very common, and the occurrence of this form of it in conjunction with sterility is especially noticeable. But there is no proof of its happening. It would have to be as intense as the spasm occurring during menstruation, and would have to last much longer than the cohabitation, since, as is well known, the zoosperms retain their activity for a long time in the genital canal. Pain also should accompany it; and this is not the case. Cohabitation often is painful in sterile women, but it is of a different nature, and can easily be referred to other causes. And if it is stated that it is the expulsion of the blood through the contracted cervix that causes the pain, and that here there is no such work to be done, it may be answered that violent expulsive pains often occur long before menstrual blood appears, and may even be felt when there is no question of the expulsion of blood at all. And on the other hand an exact examination will often reveal the fact that dysmenorrhœa is frequently dependent upon other pathological conditions of the genitals, so that it becomes difficult for us to accept this etiological view of this spasm, and to reject other and more palpable disturbances as being influential in causing sterility.

In fact I think that dysmenorrhœa has recently been more frequently dragged into relationship with sterility than the facts warrant. I do not think the connection is by any means so intimate. There can be no doubt that bearing-down pains due to contraction of the uterine muscle may occur during menstruation, and with a fully open cervical canal, and this when it has undergone little if any change, and when the central nervous organs are affected (hysteria). But this does not surprise us. Uterine contractions occur when the uterus is empty and the cervix wide open, as well as when the reverse of these conditions prevails. We see it plainly during the puerperium. Why should not pathological conditions without stenosis cause it?

And indeed stenosis may be present without causing dysmenorrhoic troubles, as when the effused blood is very fluid and small in amount, and slowly trickles through the stenosed os without the aid of uterine contractions. Nor must we forget that the genital canal is more succulent and distensible during menstruation than during gravidity, and we often find that we can then easily introduce a sound, to which there were insuperable obstacles before. And if uterine contractions occur, dysmenorrhœa may still be absent. The diagnosis of dysmenorrhœa depends upon the subjective symptoms of the woman's expressions of pain, and we know that these do not always correspond to the actual trouble. We see great differences in the perception of pain in every-day life—how differently different women behave during childbirth, with about equal amounts of uterine contraction, and the same is the case during the puerperium; one woman will hardly feel them, while another will have most violent afterpains. I have found the same thing when experimenting with secale cornutum. Is it not probable that the same differences may exist with stenosis of the cervix?

It is not out of place to note here that, of the several forms of dysmenorrhœa, only the sporadic can be active in causing sterility. If the dysmenorrhœa is not marked, it will be impossible, especially in nulliparæ, who have not experienced labor pains, and cannot make comparisons, to decide what form of dysmenorrhœa is present. We must not, therefore, lay too great a stress on it.

Even if we accept the proposition that the spasmodic form of dysmenorrhœa is less a disease of the genitals than part of a general malady, it is not necessarily therefore a cause of sterility. Frequent uterine spasm in sterile women is not in itself alone sufficient. Dysmenorrhœa of this kind, like absence of sexual passion, points to a deficiency somewhere in the complicated mechanism of reproduction, it can only be regarded as the real cause of the infecundity in the small proportion of cases where no other genital change can be demonstrated.

F. Kehrer has corrected the exaggerated estimation of dysmenorrhœa as a cause of sterility which has been held especially by English-speaking gynecologists, represented by M. Sims on the one side, who claims it to be the expression of mechanical disturbance, and M. Duncan upon the other, who believes it to be simply a phenomenon of a constitutional malady. Kehrer examined a large number of cases, and found that it was fairly a matter of indifference whether a woman had suffered from dysmenorrhœa or not before marriage. Dysmenorrhœa was absent about as often in sterile women as it was present in women who conceived regularly a short time after marriage.

Influence of the State of Nutrition.—We have already called attention to the importance of this factor as regards the fecundity of plants and animals. Nor can we fail to recognize its influence in human beings. Obesity especially is regarded as a potent factor, and the frequently sudden and rapid increase of bodily fat at the climacterium gives decided evidence of a connection between the malady and the disturbance of the sexual function. The same thing occurs when the menopause is premature. Veterinarians have observed the same thing in their patients, it having been especially noticed in English sheep.

The patients who consult us for this malady are usually young women who before marriage have been thin and delicate, and who have rapidly become fat after, or perhaps in consequence of marriage. In some cases chlorosis was present before corpulency began to set in. Most frequently, however, it appears after a pregnancy, usually the first, and is followed by a lengthy period of infecundity. There may be no genital lesion; menstruation may be regular or scanty, or amenorrhœa may be present.

Though attempts have been made to explain the connection between obesity and sterility as due to the direct pressure of fat upon the ovaries, it is more probable that the extensive deposition of nutritive material in the form of fat hinders the developmental processes in those organs. The interference with menstruation points in this direction. Though, from the fat, the examination of the ovaries is difficult in this condition, it is probable that they are not organically affected, since menstruation sets in again when the obesity disappears. In two cases which I examined under chloroform for some other cause, I found the ovaries intact, and I hold that obesity only causes sterility indirectly by hindering the expulsion of ova, and not their development.

Obesity is frequently accompanied by sterility, though in many cases fecundity is undiminished. Kisch found that among 200 sterile women at Marienbad, no less than 48 were obese.

The prospect of offspring seems to depend more upon the menses than upon the amount of fat, amenorrhoic patients furnishing a much larger proportion of cases of sterility than those in whom menstruation is normal or only scanty. Nor must we forget that the hypertrophy of the external genitals in this condition may afford a mechanical hindrance to impregnation. It will be considered further on under affections of the external genitals.

Scanty nutrition does not seem to have much influence upon human fecundity. It is true that statisticians show diminished increase in population in times of famine, etc., but it has only an ephemeral influence. Thinness only affects fertility when it is dependent upon some chronic disease.

Influence of Chlorosis.—Anæmia is a not inconsiderable cause of sterility. It is, however, usually not chlorosis alone, but the genital affections occurring with it, which exercise an unfavorable influence upon fertility. Chlorosis alone is but a relative cause of sterility. Chlorotic women often conceive, but sterile women just as often show no cause for their infecundity other than chlorosis. It appears that when the malady is so marked, the women menstruating scantily or not at all, conception is very rare. This would go to show that in consequence of the alteration in the blood, the genital congestion does not become marked enough either to cause sufficient serous effusion into the Graafian follicles to rupture them, or to cause the exudation of blood from the uterine vessels. (Scanzoni.) In other cases of chlorosis moderate atrophy of the genitals causes the sterility. In two cases which I remember very vividly, I could by no means succeed in feeling the ovaries, and the uterus was extremely small; in one the organ was anteflexed. It may be that the early setting in of chlorosis interfered with the development of the genitals, or that the non-developed state of the genitals led to the blood condition. The effect in either case was to hinder the development and expulsion of ova.

Influence of Scrofula.—It is questionable whether this malady causes sterility as often as many authorities believe. I have not seen a single case, nor have other gynecologists. Nor does the literature of the subject show it to be the case. Probably the relationship is only an indirect one, the chronic malady lasting through childhood and puberty, and leading to deficient development of the entire body, the genitals included. It may well be doubted, however, whether milder cases can have any influence at all upon fertility.

Influence of Tuberculosis.—The same may be said of tuberculosis as of scrofula as a cause of sterility. Grisolle has been its especial defender. We ourselves must, however, side with Lebert, and regard tuberculosis in all but its latest stages as without influence on fecundity. It is true that young women, in whom we suspect tuberculosis, often remain sterile, but they are as a rule "delicate" individuals, with doubtful apex catarrhs, in whom the diagnosis halts for a long time between chlorosis and tuberculosis. It is possible that in these cases a latent tuberculosis of the genitals may be present, but the rarity of the affection should prevent us from laying too great stress upon the possibility of its occurrence. It is important for us to recollect that it has recently been observed (see Weigert, Deutsche Natürforscherversammlüng in Freiburg i. B., September, 1883), that phthisical patients often have the characteristic bacillus present in the testicles, even when the genitals are apparently entirely normal. The presence of the specific morbific agent might well have a deleterious influence upon the generative elements. But the discovery is too recent and too little known for us to draw any conclusions from it as yet.

Influence of Alcoholism.—The misuse of alcohol diminishes sexual potency in the male sex, and perhaps on that account some have claimed that it is a cause of sterility. My experience is opposed to its validity, though the English physicians, and especially Matthews Duncan, believe strongly in it. He holds that it induces sterility by causing a chronic inflammation of the ovaries.

Influence of Venereal Diseases.—No one can doubt that the gonorrhœal affection is a potent cause of sterility. I shall return to its consideration under the head of local causes. But I do not believe that the constitutional affection, syphilis, is a frequent cause. The special literature of the subject by no means proves that the malady has any unfavorable influence upon conception at all. It does happen that marriages in which one or both parties suffer from constitutional syphilis, are often childless. But they are not unfruitful, as witness the repeated early abortions which usually occur. It is possible that the changes caused by frequent abortions may eventually lead to sterility, even in non-syphilitic women. And the frequent combination of the constitutional disease with gonorrhœa, which may exert its evil influence even when latent, may explain the sterility in some cases.

Influence of other Chronic Diseases.—It is probable that other chronic diseases may lead to sterility, especially when they are constitutionally depressing in their action, whether they be local or general. It seems possible that the functions of the ovaries may thereby be greatly depressed or abrogated. Neither the pathologists nor the gynecologists say much upon this subject. But the severer maladies would certainly forbid cohabitation, or intercourse would be affected in such a manner as to "protect the woman," and render conception impossible. Hence statistics upon this point would have but little value.

Influence of Acute Diseases.—Acute maladies are not directly involved in the question of sterility, though we may inquire whether they may not cause such changes in the genitals as to lead eventually to sterility. As is well known, Slavjansky has shown that acute diseases, such as typhus, cholera, septicæmia, etc., lead to disappearance of the follicular part of the ovary, and Myschkin has proved the same as the result of poisoning from metallic substances. The chances are hence that here we may possess further causes of sterility.

CHAPTER XVI.

ON THE CAUSES OF FEMALE STERILITY DEPENDENT UPON LOCAL DISEASES.

IN the group of obstacles to conception just described, the trouble resided in diseases of the whole body or of distant organs. As a counterpart to these, though not entirely separate from them, there are those causes of sterility which are founded upon defects, diseases, and functional disturbances of the genitals themselves. Those are the constitutional factors, these the purely local ones.

Among the latter we generally distinguish three kinds: We speak of "impotentia coeundi," when impregnation is made impossible or difficult by the very inability of executing cohabitation in the regular manner; of "impotentia concipiendi," in the more narrow sense, when coition takes place properly, but still conception does not occur; thirdly of "impotentia gestandi," when conception takes place, but the impregnated ovum can not develop itself further. A considerable number of pathological conditions of the genitals can be classified with certainty under the one or the other kind, but with a number of others the classification is doubtful. I therefore prefer not to make any such distinction, but to treat of the obstacles to reproduction, under which term we may embrace the three groups, purely anatomically, *i.e.*, according to the separate organs of generation in order.

Diseases of the Ovaries.—The function of the ovary as an organ for preparing or secreting germs may be interfered with in various ways and sterility be thereby produced. But it must not be forgotten that the ovaries are paired organs, and therefore sterility necessarily requires an affection of both ovaries. The cause may rest in certain material disturbances of the ovaries themselves, or their functions may be disturbed by causes at work close by or at a distance, their own structure being intact.

An absolute obstacle to conception is brought about by total absence of both ovaries. This defect probably occurs very rarely by itself in an individual otherwise normally built; there is in fact but one authentic case recorded (Morgagni). Generally this defect is coupled with total absence of the remaining internal organs, or at least with a rudimentary development of them. In the one case as well as in the other there is of course no possibility of conception taking place. But there also occurs a deficiency of one ovary, generally with mal-development of the corresponding side of the internal genital apparatus (uterus and tubes). If the other ovary is normally developed and the corresponding half of the internal genitals likewise, as for instance with the "uterus unicornis," conception is not excluded. Of almost equal importance with the total absence is an imperfect development of the ovaries (so-called congenital atrophy). The anomaly consists in a smallness of the ovaries, and at the same time an absence or very imperfect development of the Graafian follicles. An ovary which in size, form, and structure represents the infantile ovary, may occur with other internal organs that are normal. This condition also as a rule brings about an insuperable sterility.

Besides these congenital anomalies which from the start exclude any production of germs, there are a number of affections which attack a fully developed ovary that has had its normal function, and deprive it of the ability of producing the female element. The function of the ovaries does not persist throughout life, but is extinguished after an activity at a time which we call the climacteric period. This extinction keeps pace with a change in the ovaries, that consists essentially in a degeneration of the glandular, follicular elements, and in a hyperplasia of the connective-tissue stroma. This change, which as a rule does not take place suddenly, but gradually within a number of years, brings about the greater rarity of conception in the third decennium of the sexual life of a woman, but this period may occur much earlier without any assignable cause, accompanied by all the other phenomena of the climacteric age: stoppage of menstruation, strong development of the adipose tissue, various troubles, etc. The cause of premature menopause can often with certainty be traced to an atrophy of the ovaries. Not infrequently women who have married late, and to whom, with the small number of their children, sterility is by no means welcome, are surprised by this premature involution of their ovaries, and present themselves for a closer examination of these organs. This premature senile atrophy of the ovaries, however, rarely occurs as an idiopathic affection; it is generally combined with other changes in the genitals or general diseases of the body. I must, however, remark at once that the interruption of menstruation alone by no means indicates a premature extinction of ovarian activity, but is often caused by other conditions already stated, or yet to be mentioned. But then the ovaries as a rule are found intact. Another cause of acquired sterility is found in the inflammatory processes in the ovaries. It is well understood that in nulliparæ, and much more frequently in multiparæ, changes take place in the ovaries which, together with a certain train of symptoms, are designated as chronic oöphoritis, cystic degeneration, etc. I have in another place expressed my opinion to this effect, that here there is a disease which sometimes may attack more of the follicular apparatus, sometimes more of the connective-tissue stroma, and thereby may present different anatomical pictures. According to my experience this disturbance in the nutrition, when strongly pronounced, gives rise to sterility. At least I find among the cases treated by me a considerable number in which the acquired sterility had to be considered as a consequence of this trouble. Sterility here is brought about either by the degeneration of the follicles in consequence of hyperplasia of the fibrous framework, or by a thickening of the surface which prevents a rupture of the Graafian follicles. Among our domestic mammals, also, it is said that oöphoritis is a cause of sterility.

Whether the acute inflammations of the ovaries, also, can by their sequelæ diminish germ production, is uncertain; with our imperfect knowledge of these pathological processes, it is difficult to say anything definite about this. But when at autopsies we see the severe lesions of the ovaries in puerperal septicæmia, and when, on the other hand, we find, though not so very frequently, that women who have recovered from severe puerperal fever have their menstruation interfered with and remain sterile, and this where no remains of exudations can be found, we are then not unjustified in believing that this sterility is dependent upon extensive changes in the ovaries. It is similar with those fairly frequent cases of gonorrhœal infection with acute and sub-acute peritonitic symptoms; here also sterility is not a rare sequel. If in these cases remains of a peritonitis can not be detected, the belief would be justified that here as well as in males the germ-producing gland had been infected, and that its function was similarly interfered with. Could it not be possible that here the ovules, like the sperma, experience a similar degeneration which makes them useless for reproduction?

Another class of sterile women is furnished by the tumors of the ovaries. Absolute sterility, however, is out of the question, unless both ovaries are attacked by the neoplasm, and unless in both the follicular apparatus has degenerated. Those kinds of tumors, therefore, which preferably possess these qualities, will prevent conception. But of the various tumors, it is the carcinomata that show this tendency, the very tumors which by their malignancy, rapid development, and unfavorable influence upon the constitution would exclude the possibility of conception. With the most frequent form of tumor, the adenoma of the ovary (cystoid), conception is not a rare occurrence. Thus in the last years, in the obstetrico-gynecological clinic of this place, ovarian tumors were observed not less than seven times complicated with pregnancy; in these cases the tumors later on have generally seriously complicated labor. Even with a colossal development of such cystoids, conception is not excluded; thus I know a case where the neoplasm filled almost the entire abdominal cavity, and still pregnancy occurred. Abortion with considerable hemorrhage led to her death. (The preparation is in the collection of the gynecological clinic of Würzburg.)

In spite of all this these cases must be considered very exceptional; their number is very small as compared with the cases of ovarian tumors that, growing slowly, are found on both sides in different stages of development. Sterility is certainly the rule, which has but few exceptions. The cause of this is fairly plain. When there is bi-lateral disease, even when the tumor is small, the neoplasm embraces the whole ovary; the follicles either degenerate or become enlarged, but they no longer rupture, and therefore are no longer fitted for secreting ova. But even when only a part of the ovary is taken up by the new growth, and the remainder is preserved, regularly discharging ova from the unchanged follicles, yet the change of the relations of space brought about by the enlargement of the ovary renders difficult the conduction of the ovum into the tube. The part whose tissue is normal is removed from the fimbriated extremity of the tube, and it requires very favorable conditions to enable the ovum to find its way. To this is added the considerable elongation, narrowing, and distortion which the tube suffers by following the expansion of the tumor with the wall of which it is connected. The changes mentioned are also unfavorable for the onward movement of the ovum. But even in case the second ovary is normal, yet the growth of the degenerated ovary produces such changes in the position of the pelvic organs, that the tube of the healthy side is also removed from its ovary, so that the ovum is not received in it. In case of small, slowly developing tumors the partial inflammations of the peritoneum are not to be disregarded. By these, as we shall see, new difficulties are presented to the onward movement of the ovum. If a physician is consulted because of sterility, it is much less frequently a case of large ovarian tumor than one of small tumor, slowly growing cystoid, hard tumor, dermoid. According to my experience, the sterility here chiefly depends upon the circumstance that both ovaries were affected, though one tumor may exceed the other considerably in size. I have often found tumors of the size of a walnut up to that of an egg. By no means do all tumors, not even cystoids, grow so rapidly as is often believed. It is just these small tumors which not rarely are found to be the cause of sterility. Of equal importance to the ovarian tumor proper are the parovarian tumors, inasmuch as they also produce sterility mechanically by the above-described dislocations and changes in the pelvic organs.

Formerly the question was often raised whether sterility was not rather the cause than the result of ovarian tumors. According to my opinion, there is very little that speaks for sterility as the primary thing. The cases where ovarian tumors developed in women who had for a long time been sterile, the only cases which could support the above hypothesis, are much more easily explained by an adenomatous disease of the ovaries, which appeared early, preventing conception, but which remained latent until it manifested itself much later by an increased growth. A number of cases of sterile women, in which I have watched the exceedingly slow growth of the tumors, prove to me that the belief is untenable that the interference with the sexual function should have such serious consequences for the ovaries.

As for the frequency of ovarian disease as a cause of sterility, it is somewhat less than affections of the surrounding parts. Boinet states that $\frac{4}{5}$ of the women who have ovarian tumors are sterile; this number is probably somewhat too high. Veit comes nearer the truth when he accepts the percentage of sterile women at 34 per cent., and Scanzoni agrees with him. He found among 45 women 13 childless ones. The anatomical researches of Winckel also showed a considerable number of ovarian tumors among sterile women; in 150 cases he found them not less than 32 times; among these, 30 were unilateral, a fact worthy of our observation. Among malignant tumors conception is still rarer, probably because they almost invariably attack both ovaries. In the two cases that I have met in literature, there was in the one (Mosler) but one diseased ovary, in the other case (Förster) only the beginnings of a carcinoma in both ovaries were present.

Diseases of the Peritoneum and of the Parametria.—We have already seen how imperfect is the contact between ovary and tube, and how the ovum in the distance which it has to travel within the peritoneal sac, even under normal conditions, is in danger of missing its aim and thus perishing. But this very place is also frequently the seat of pathological processes which prevent the wanderings of the ovum. In fact a great many cases of sterility are traceable to such affections.

The cause of sterility may sometimes reside in congenital defects. Klebs has called attention to the fact that sometimes the only connection existing between ovary and tube, which consists in a fimbria of the tube reaching over to the ovary, may be absent, thus considerably separating the two. Still more unfavorable a condition is found when abnormal formations, as for instance small cysts, interpose themselves between these two organs. An abnormally long tube also seems to have a similar effect. A simple change in place of the ovaries may bring about a similar separation. If one or both ovaries are situated in a hernial sac, be it congenital or acquired, conception is hereby rendered much more difficult, though it is not entirely prevented, as some examples show. Sterility which accompanies a position of the ovaries in Douglas's sac, though freely movable, may sometimes be in part ascribed to this same condition. Of course here there are frequently further changes of the ovaries themselves also at work.

Still more important than these abnormalities, the unfavorable effect of which is not rarely paralyzed by the fact that they are unilateral, so that the healthy side may perform its normal function, are the inflammatory processes, which often occur in this region, and not infrequently are bi-lateral. Their etiology is not a part of my task; be it only briefly mentioned that they occur as consequences of puerperal inflammatory processes, gonorrhœal infection, hemorrhages in the environs of the uterus, especially in the pouch of Douglas (hematocele), local diseases and dislocations of the pelvic organs, especially the ovaries and tubes, more rarely the uterus.

As for the frequency of the etiological factors leading to these obstacles, an important *rôle* among women who have borne children, and, therefore, have acquired their sterility, is played by puerperal affections that remained after difficult instrumental deliveries, or in consequence of septic infection. Among women who have never conceived, it is often the diseases of the ovaries already mentioned, as chronic inflammation and cystic degeneration, that give rise to adhesions, etc. Somewhat more frequently in such women a gonorrhœal infection is responsible for these changes. There has been much dispute in regard to the frequency of this extremely important factor. The cause of this difference of views consists, in my opinion, in the fact that in many cases much too long a time has elapsed since the real or imagined infection, so that the original train of symptoms, which is somewhat characteristic for gonorrhœal infection, can no longer be ascertained, the less so inasmuch as in newly-married women the traumatic irritation of the genitals may call forth similar symptoms. Furthermore, inasmuch as gonorrhœal secretion and benign discharge, the existence of which can not be denied, are not as yet distinguishable, and as the disease of the husband can not at all or not evidently enough be determined, it is often difficult to recognize gonorrhœa by the aid of these imperfect items. (Whether the gonococci in these cases also are of diagnostic value the future must teach.) According to the greater or less degree of scepticism that we adopt, the frequency with which we accept infection as a cause of sterility will also vary. I am not inclined to lay too much of the burden at the husband's door, for simple catarrhs of the genitals occur often enough in virgins and even in children, which extend over the entire genital tract, and are certainly able to produce adhesions at the abdominal end of the tube, so that chaste women may well have had this obstacle to conception on entering married life. Much more rarely the history points to the various changes in the position and form of the uterus, and still less frequently to a preceding hematocele.

It must be especially mentioned that the same effect is seen whether the affection takes an acute or a chronic course, and that intensity of the process has no effect upon the production of sterility. Thus a septic peritonitis that runs its course with the production of copious exudation may in a short time be followed by conception, while a chronic circumscribed pelvic peritonitis that almost remains latent forever puts an end to fertility. The transferring of the ovule from the Graafian follicle to the tube may be prevented in various ways. There often remain large exudations after a pelvic peritonitis for a long time; this has been more striking to me after gonorrhœal infection than after puerperal inflammations. Here the space between tube and ovary is filled up, or the exudations encircle the ovaries, especially when the inflammation has started from the latter, forming a thick layer that prevents the exit of any ovum. Often the effect of this perioöphoritis is a great thickening of the surface of the ovaries, forming a covering that is stronger than the intra-follicular pressure of the Graafian follicles is able to rupture. If the inflammation starts from the tube, the exudation may stop up its fimbriated end; more frequently the exudation forms masses of connective tissue which close the tube; but generally it is not the exudations themselves that cause sterility, but the remains of them, the cicatrices and calluses, the false membranes and bands. The changes which these are able to produce in the region of the true pelvis can be very well studied in operations for the removal of the appendages.

These inflammations also cause dislocations of the ovaries and tubes like those already described. Thus sometimes the ovary is found in the space of Douglas fastened down. Sometimes it is fixed to the corresponding synchondrosis, so high that it can scarcely be reached through the vagina. In a similar way the fimbriated end of the tube may be displaced and fixed in its abnormal position. More rarely other organs, bowels or omentum, are interposed between ovaries and tubes and fixed in that position. Not infrequently these adhesions work unfavorably in an indirect manner, for instance by fixing a retroverted uterus in its abnormal position and thus secondarily disturbing the important anatomical relations between ovary and tube.

We know much less about the influence of parametritic processes upon reproduction. There is, however, no doubt that the formation of exudations and cicatrices is able to bring about dislocation of the pelvic organs, especially compression, displacement, and thereby flexion of the tubes. Thus it may probably be accepted that in this indirect way they may unfavorably influence the process of generation. But perhaps in such a case the unfavorable influence may also be explained by the perimetritic changes present at the same time, for these two kinds of inflammations often occur in combination.

It is necessary to state that frequently affections of the vagina and uterus occur in combination with para- and perimetritic processes. Thus it may happen that a simple affection of the former is followed by sterility, or that in spite of removal of obstacles that offered themselves to the sperma, for instance in the cervix, yet no conception ensued. Thus these inflammatory processes in the environment of the uterus, form one of the most important and most frequent causes which in many different ways bring about sterility in the same individual.

Almost everybody who has diligently studied the question of sterility, is of the opinion that the inflammations of the pelvic peritoneum and of the parametria, or rather their consequences (exudations, formations of bands and adhesions), are to be regarded among the most frequent causes of female sterility. Thus in 200 cases of sterility reported by Kisch, 110 were due to pelvi-perimetritic, peri-oöphoritic, or parametrial exudations. S. Kammerer observed 408 cases of sterility clinically, and found in 94 of them that they were due to peri- and parametritis. Kehrer was able to find peritonitic adhesions in 33.1 per cent. of his cases of sterility. The anatomical researches of F. Winckel and Beigel also offer much material that shows the importance of the inflammatory processes in the pelvis as obstructions to reproduction.

Diseases of the Tubes.—We have seen in the preceding section to what dangers the ovum is exposed in its course from the ovaries through the peritoneal cavity to the tubes. In the latter it may meet new obstacles, which partly also obstruct the sperma in its movement in the opposite direction.

Here also defects in the original condition may offer an insuperable obstruction to conception. Total absence of the tubes, or non-patency of the upper section of Müller's ducts, which should change into the tubes, if it exists on both sides, absolutely prevents impregnation. Generally in these cases, the uterus is also in a rudimentary condition, and this assists the production of sterility. If the defect exists only on one side, conception is possible, as those cases of pregnancy with a uterus unicornis prove. Similar to these defects is congenital atresia of the tube, where the abdominal end of this organ is closed. This closure is also found among animals as a cause of sterility. It is very uncertain whether supernumerary openings in the tubes, also a failure in development, may be regarded as a cause of sterility. It is said that the ovum after having entered the tube through the fimbriated extremity, again may find its exit through a supernumerary ostium, and that in this way sterility is produced. The possibility of such an occurrence can not be denied, but it is by no means proved. We have already spoken of congenital abnormal length of the tubes, by which their fimbriated extremities are removed too far from the ovaries.

The dislocations of the tubes are yet to be mentioned; they are caused by a series of pathological processes which we have already become acquainted with, and which we shall meet with again; processes, most of which are themselves capable of producing sterility. We only have to add the herniæ of the tubes. But here as a rule the ovary is also situated in the hernial sac, thus neutralizing the disadvantage of malposition.

Of much greater importance in regard to the production of sterility, are the inflammatory processes in the tube and around this organ. Salpingitis, or catarrh of the tubes, is of considerable importance, because of its frequency and especially by its bi-lateral occurrence. We need not here discuss its etiology, in which gonorrhœal infection and puerperal processes play a very important *rôle;* we are only concerned with the sequelæ of the inflammation. It has already been mentioned that tubal catarrh may extend to the peritoneum and give rise to exudation. The consequences of this process have already been spoken of. Often, however, the inflammation remains confined to the neighborhood of the ostium abdominale, whereby the fimbriated extremity becomes fixed, removed from the ovaries, and incapable of undergoing changes of form resembling erections. A further consequence of such an inflammation that is confined to the ostium abdominale, is stenosis and atresia of that opening, a condition not infrequently found in the cadavers of sterile women. It is easily comprehensible that the chances for the reception of the ovum are much less in case of stenosis than when the wide, funnel-shaped infundibulum is open; when there is double atresia, sterility of course is absolute.

This atresia with its results is also found among our domestic mammals. If then by a collection of secretion and pus, those tubal sacs known as hydro-and pyosalpinx are formed, the obstacle to conception comes into the foreground in a palpable form. It is not necessary, however, for a salpingitis to develop so far as this in order to produce sterility. Even a considerable swelling of the mucous membrane of the canal, which in the normal condition is extremely narrow where it penetrates the wall of the uterus, may prevent the passage of sperma or ovum. As a rule, in the above-named tubal sacs, only the abdominal end of the tube is found closed, the uterine extremity being merely plugged, but this plugging closes the lumen of the canal so efficiently that the strong pressure of the fluid within the sac is not able to free the uterine end of the tube. Small polyps that close the lumen of the tube may retain the ovum in a similar manner; some cases of tubal pregnancy are even ascribed to them. Since, however, these formations are to be regarded merely as the expression of an intense catarrh, it would be difficult, in any given case, to ascribe the cause of sterility to them alone. Whether strictures or atresiæ may occur in the lumen of the tubes, and like stenoses of the cervix may favor sterility, has not been ascertained by pathological anatomy. Generally, however, the ovum can scarcely get so far into the tubes; the secretion which has collected in the wider portion of the tube, and which even according to the anatomical position of the tube can not empty itself into the uterus, alone is able to prevent the onward movement of the ovum, which is not capable of spontaneous motion. It is not improbable that the secretion may exert an unfavorable influence also by virtue of its chemical qualities, or by a specific character, as in gonorrhœa. Whether the ovum may also suffer by this is uncertain. It is highly probable that conception is essentially interfered with by the removal of the epithelium, the movement of whose ciliæ is mainly active in effecting the onward movement of the ovum, and in chronic inflammations, by the fact that it is replaced by cells that are in no way equal to this task. We are not unjustified in the belief that the muscular tissue of the tube is obstructed in its movements by serous infiltration and swelling, as well as by the onset of further changes when the trouble is of longer duration, thus again interfering with the onward movement of the ovum. Each of these factors alone may disturb the normal course. A combination of them, and such occurs often enough, would the more certainly obstruct the passage of ovum and sperma.

Next to the plugging of the tubes by their secretions, comes the filling of the canal with tubercular material; for in tuberculosis of the genitals, inasmuch as the process generally begins in the mucous membrane of the oviducts, and then as a rule is bi-lateral, this affection would indeed be able in such cases to render the tube impervious. Considering, however, the comparative rarity with which this disease attacks the genitals, and the rapidity with which it also invades the uterus and peritoneum, we can not lay so much importance on this etiological factor as some are inclined to do.

Neoplasms like fibromyomata, cysts, in the wall of the oviduct are of rare occurrence; moreover they are so small that they project but little into the lumen of the tube; they, therefore, deserve but little attention in regard to etiology.

While the processes above-mentioned take place in the mucous membrane of the oviduct itself, and thereby narrow or close the lumen, there may also occur a stenosis of the tube by pathological processes acting from without, the tubes being in a more or less normal condition. Here we must mention the ovarian tumors already discussed, also the tumors of the broad ligaments as well as neoplasms in the wall of the uterus. These may remove the abdominal end from the ovaries, may narrow the canal considerably by greatly stretching it, may compress it directly, or may render its peristaltic movement impossible. The perimetritic processes and their remnants, already mentioned, besides forming bands and cicatrices, may also flex the canal sharply at one or more places, and thus produce strictures in the lumen.

It is very doubtful whether, with perfectly healthy oviducts, sterility may be produced by disturbances of innervation. This has formerly been maintained for the production of tubal pregnancy, and has recently been again advocated by Freund. This serious functional disturbance might consist either in a tetanic contraction of the circular muscle fibres, so that the ovum can not get through, or in a paralysis preventing the onward movement. In this way psychical factors might be believed to influence conception. At the present time, when the phenomena of the normal movement of the tube is not yet thoroughly understood, such opinions can only be regarded as hypotheses, which, considering the long time that ovum and sperma need for their migration and meeting in the tube, have not much probability.

Inasmuch as the defects and diseases of the tubes are rarely ascertainable clinically with any certainty, there are no figures given by practitioners as to the frequency of these obstacles to conception. Winckel, on the other hand, in his anatomical researches, very frequently found the ovaries adherent to the tubes, but still in such a condition that conception might be possible, but in other cases he found such considerable adhesions between oviduct, ovary, uterus and rectum that conception would be an absolute impossibility. Moreover the abdominal end of the tube was closed in nine cases. Tuberculosis was also frequently found. Winckel states the frequency of this condition as an almost surprising one; he puts it at 10 per cent. of all cases.

Diseases of the Uterus.—Of the malformations of the uterus only a fractional part offer any obstacle to conception.

When the uterus is completely absent or entirely rudimentary, not even a cavity being formed, conception, of course, is out of the question. These malformations may occur not only in monsters unfit for life, but also in individuals well developed in other respects, with a completely womanly shape, and having normal external genitals, with a vagina terminating in a blind *cul-de-sac*. These cases may, therefore, become subjects for examination in regard to sterility. I have recently had the opportunity of examining a girl twenty years of age, well developed, and of perfectly womanly appearance, in whom, even under chloroform narcosis, scarcely a trace of internal genitals could be detected. She consulted me only because on account of her amenorrhœa she had hesitations about entering married life. Nothing definite could be detected in regard to sexual tendencies. Even if the ovaries were normal, however, which is not the case, there could of course be no treatment. Of the remaining congenital abnormalities, uterus unicornis, uterus bicornis, uterus bilocularis, none offer an obstruction to conception, for the paths for sperma and ovule are normal, in spite of the unusual shape of the canals. It is only the partition walls that, if they extend down into the vagina, may prevent cohabitation, and therefore conception; these will be discussed further on. There is still another way in which the double formations render conception difficult. It is known that the genital tract from the fundus down to the hymeneal ring may, by the persistence of the septum, be divided into two more or less symmetrical canals, each of which alone may suffice for the function of generation. It is a difficult matter when only one of these canals remains open, while the other at some one place is closed. If now the discharge of menstrual blood regularly ensues, then after puberty there will soon be such a collection of blood in the closed cavity, that medical assistance will be sought before the question of sterility comes into consideration. When, however, the menstrual discharge is very scanty, when it appears only at longer intervals, or when it is altogether omitted, and is replaced only by a more copious production of mucus, the tumor may grow so slowly and without many symptoms, that sterility in marriage only calls attention to this malformation. If then the closure is located at the level of the os uteri externum, then the blood tumor formed by the closed half of the cervix may press the canal so far to one side that the obstruction is similar to that which we shall learn about with tumors situated in the wall of the cervix. But if the atresia is situated lower down, the tumor may at the same time also close the os uteri of the open side from below, and if situated still lower down, it may even obstruct cohabitation.

The congenital atresiæ of the uterus also belong in this place. This defect very rarely remains unnoticed until an examination is made for detecting a cause of sterility; if so, there is amenorrhœa and generally a dwarfed uterus. More frequently there might be found a small retention tumor, which was slowly produced by a collection of mucus and pus due to the closure of the os uteri. As a rule, however, the menstrual blood collects in larger quantities after puberty has been reached. Here again assistance is not sought for sterility, the patients not being married, but on account of the existing hematometra. It is only after the uterus is emptied that the opening newly made by operation may become the subject of medical treatment for sterility. It is true that with a simple atresia of the os externum the opening might be easily maintained, so that not only the menstrual blood can flow out, but also the sperma can enter through it; but it is a different matter when the atresia also embraces a portion of the cervix and of the fornix of the vagina, *i.e.*, where a utero-vaginal atresia had existed. Here, too, there is not merely a simple opening, but there is a canal of greater or less extent, which always shows a tendency to rapid diminution of its lumen, or even to complete closure. Under these circumstances sterility may be the result. What a difficult task it is to keep the canal open, I have lately experienced in a case where in spite of extensive dilatations, excision and union of the uterine and vaginal mucous membranes by suture, so as to cover up the walls of the canal, nevertheless a narrowing again took place. Here a removal of the sterility would render the hope much more likely as to permanent maintenance of the canal.

The generative processes may also be essentially impaired by an imperfect development of the uterus. This may show itself in various degrees. In a number of cases the form even in adults is an almost fœtal one; the uterus is in that stage of development which corresponds to the end of embryonal life, having remained stationary through childhood, and also at puberty. The cervix uteri forms the main part of the organ; the small, thin body is more like an appendage of it, and is often anteflexed. The palmæ plicatæ extend almost to the fundus. The entire organ is too small. This condition, often called infantile uterus, I should like to designate as uterus fœtalis. Another form consists in this, that the uterus, while normal in form, is abnormally small in all its dimensions. The cavity is short, the walls very thin, the vaginal portion small. This is the form that has been called uterus pubescens (Puech), hypoplasia of the uterus (Virchow); most generally, however, it is known as congenital atrophy of the uterus. From its small size I should be inclined to call it uterus infantilis, were it not that the uterus of infancy had a fœtal form. In these two forms which together may be combined under the name of hypoplasia of the uterus, conception is in the majority of cases excluded, disregarding other causes, for the reason that probably the ovaries also are in the fœtal stage of development, and the follicles, if present, do not rupture, for which reason such individuals often suffer from amenorrhœa. As a rule, the disturbances connected with it (affections of the heart, severe chlorosis, a weak, imperfec development of the body) are such that a marriage is not concluded. In rarer cases such individuals are healthy and well developed but sterile. With the imperfect statements furnished by authors upon the condition of the ovaries it is difficult to decide whether the uterus is unfit for the reception and development of the ovum, or whether it is the fœtal condition of the ovary that renders conception impossible from the start.

These uteri, that rarely enough come under medical observation, are of great interest, inasmuch as they do not occur as a class by themselves, but in my opinion gradually merge into the normal form and size of the organ of parturition. For there certainly occur not a few cases of chlorosis and sterility, in which the uterus is certainly not of normal size, but on the other hand cannot be designated as fœtal or infantile. These are cases where the uterus, besides being small, also shows slight anteflexion, that is easily corrected by the sound—cases which certainly have assisted in the assumption that anteflexion was the normal position of the uterus. Here Schultze is certainly right in saying that in these cases the flexion is not the cause of sterility; the imperfect development of the uterus, and probably of all the genital organs, is the cause of this defect; it then of course resists all mechanical treatment. If these cases are classed with uterus infantilis, then the latter is indeed not a rare occurrence. This also explains the difference among observers as to the frequency of this anomaly; for instance, while Chrobak restricts the idea of uterus infantilis in narrow limits, and therefore among 100 cases of sterility discovers but one imperfectly developed uterus, Beigel says that among 155 sterile women he found the infantile uterus 4 times, and Kisch even found it 16 times among 200 cases of sterility. Certainly the hypoplasiæ of the uterus, and still more the transitions to the normal womb, represent not an inconsiderable number of sterile women, especially of those who have married early. It has already been mentioned that the uterus does not reach its full development before the twentieth year, before which time its development is still imperfect. It was also said at the same place that in this not quite perfect condition of the internal genitals conception may follow later, but also that by cohabitations the foundation may be laid for lasting sterility. (See *ante*, Influence of Age.)

Malformations of the Vaginal Portion.—Next to the malformations of the uterus we have a deformity of the vaginal portion, which in the doctrine of sterility plays an important part; this is the so-called conical elongation of it. It consists in this, that the vaginal portion is not merely elongated, but it also tapers off into a point. The external os is almost always very small and of a roundish shape, the cavity of the cervix is as a rule, in a condition of catarrh. This fault is rarely acquired; it can certainly not, as Grünewaldt would have it, be considered the consequence of a disease of the walls of the uterus, for although endometritis may occur in connection with it, chronic metritis does so very rarely. The very fact that most women with conical vaginal portions have never borne children, speaks decidedly against Grünewaldt's explanation, inasmuch as the so-called chronic metritis is rather rare in nulliparæ. (See Chronic Metritis.) This form of the vaginal portion is rather to be regarded as a congenital malformation. Its frequency has been greatly over-estimated. Even if the transition forms between it and the normal vaginal portion are included, we can not get such high figures as are given by Marion Sims, who in 218 cases found this abnormality not less than 116 times. Kisch was able to find it only 8 times in 200 sterile women. If the chief weight be attached to the elongation and not to the narrowness of the os, this figure is certainly not too low an estimate.

As for the manner in which this abnormality prevents conception, we can scarcely believe that the penis passes by it into the fornix; the abnormal length of the cervix is rarely so considerable that the ejaculation of the sperma could result too high up above the os externum. This could only occur where there is the penis-like elongation of the vaginal portion, a form which, however, is not closely related to the conical form. It is much more probable that the narrowness of the os externum, almost always combined with it, and its consequences may prevent the entrance of the sperma. The success of merely slitting it open for the cure of the sterility, speaks decidedly in favor of the fact that it is not the form and length, but the narrowness of the os externum that forms the most important feature of the abnormality.

We next come to the benign, simple hypertrophies of the vaginal portion. They may occur in various forms in women who have never borne children, but they are generally the consequences of difficult labors or diseases of the uterus, and therefore properly belong under the consideration of causes of acquired sterility. The hypertrophy would scarcely assume such dimensions as to prevent or even greatly to obstruct the entrance of the penis. When the penis is not introduced deeply, ejaculation of the sperma in the vicinity of the os externum may indeed ensue; if there are no further changes in the cervix, conception of course may occur. But if the penis passes by the elongated vaginal portion, the sperma will be deposited in the fornix at a considerable distance from the external os, and the chances for the sperma to enter the os are much less. It is similar with a considerable hypertrophy of one lip—the os indeed is in the fornix, but the ejaculation constantly takes place into the fornix opposite the os externum. Thus the enlarged lip forms a barrier between sperma and os uteri. But according to my opinion the hypertrophy must be a considerable one; the abnormality, therefore, known as apron-like vaginal portion, is scarcely of that importance which Marion Sims and Beigel ascribe to it, for that which is generally described and depicted as an apron-like vaginal portion, is too insignificant to offer any obstacle, even if there be but a moderate quantity of semen. Very probably the changes in the cervical mucous membrane, out of which such hypertrophies easily arise, are here the obstacle to conception.

It is similar with the hypertrophies of the supra-vaginal portion of the cervix. Here also the abnormal condition of the excessively long cervical canal may form the chief cause of sterility. The low position of the os uteri would scarcely favor conception, inasmuch as even with these forms of elongation the one fornix is sometimes placed high, so that the penis may pass by its aim and get lost in the fornix, or else the relaxed vaginal walls permit the penis to force them up. As such hypertrophies rarely occur without other combinations that are related, in regard to etiology, to the disturbance that we are speaking of, these complications deserve our full attention.

Marion Sims and Beigel also regard the deficiency of the vaginal portion as an obstacle, though a slight one, to conception, since that portion of the uterus, which should dip into the receptaculum seminis, is absent. (See *post*, among defects of the vagina.) This arrangement, considered by some to be of great usefulness for the purpose of conception, will receive further attention elsewhere. I deem it so important that I can not share that opinion; on the contrary, it seems to me that the absence of the vaginal portion renders conception easier, since the sperma is hereby conducted more directly to the os externum. When sterility accompanies this condition, it is much more likely that general atrophy of the uterus, congenital or acquired, which occurs much more frequently than is generally believed, is the cause of it, or else the ulcerative processes which lead to a destruction of the vaginal portion, have brought about changes in the canal of the cervix itself—as for instance stenosis, which may obstruct the advance of the semen.

Stenosis of the Cervix.—Among the affections of the cervix, stenosis plays an important part. It may affect the entire canal, or a great part of it, or it may be confined to one or both ostia.

Total stenosis of the cervix not infrequently occurs as a congenital defect. A very fine probe penetrates without much difficulty through the external os, that can scarcely be seen or felt, and enters through the canal into the uterine cavity proper, but it is impossible for a uterine sound of the ordinary calibre. To judge from my experience, this high degree of stenosis, which may render the entrance of the sperma difficult, or may even entirely prevent it, occurs very rarely with an otherwise normal uterus. The smallness of the vaginal portion and of the body, which not rarely appears anteflexed, show that the narrowness of the canal is merely one symptom of the faulty development of the uterus itself. Scanty menstruation together with the anatomical condition speaks decidedly in favor of this supposition.

Not infrequently a congenital stenosis is confined to the os externum; it can scarcely be discovered on examination by touch, and by the aid of the speculum is recognized as a very small round opening from which, as a rule, a drop of mucus is seen to protrude. The ring formed by the external os is round, not soft and flexible, but generally strongly resistant and of a whitish appearance; desquamation of the epithelium in the surrounding parts also occurs. The ordinary uterine sound can not be introduced into the opening; it glides over it, since the button is too large. Only a probe of smaller calibre, like those used in surgery, can pass the stenosed place. The cervical canal behind it may be narrowed, or normal, or, on the contrary, may be more or less widened; the cavity is then filled with mucus, or, as I once observed, with large masses of pus. The uterine mucous membrane is frequently in a catarrhal condition, however. I have rarely found in nulliparæ those changes in the body of the uterus which are to be explained as chronic metritis. The smallness of the uterine body also, that not infrequently is combined with stenosis of the entire cervical canal, is observed less frequently in partial stenosis of the os externum. The body of the uterus is generally quite normally developed. The vaginal portion may be normal; sometimes it is somewhat elongated or tapering, so that the transitions to the normal vaginal portion, as well as to the conically elongated vaginal portion, occurs in a large proportion of cases.

There has been much dispute about the significance of this stenosis, while some do not attach any importance to it, inasmuch as the spermatozoa can enter even through the smallest opening; others again consider it a great obstacle to conception. This divergence of opinions that are rather sharply opposed to one another, is largely founded upon the various views held in regard to the mechanical obstacle to conception. The latter exists according to the opinion of some only where the meeting of sperma and ovum is rendered entirely impossible, or occurs very rarely. Absolute and relative causes of sterility are not exactly distinguished by them. Yet such an obstacle must exist when the meeting of the two forms is not absolutely prevented, but merely rendered more difficult. The narrowing of the external os undoubtedly offers an obstruction of this kind. Let us represent to ourselves the conditions at the os externum: the spermatozoa that are deposited in the wide hollow space of the vagina, having no instinct to lead them to the os, will meet the latter only by chance. If the diameter of the os is diminished only by one half, the chances of meeting must be only one third as great. But as a rule, this amounts to little with the usual large number of spermatozoa, but it must at once become marked when there are complications which here are frequently present, and may in various ways increase the obstruction.

The relation of the mechanical cause of sterility to the frequency of conception, might be elucidated by the following examples: Suppose there are ten women, perfectly healthy, with normal os uteri; they all conceive. Now let us take ten other women in whom a narrowed os uteri can be demonstrated; of these eight conceive, while two remain sterile. Why the last two did not conceive while the first eight did, is the next question. Perhaps the secondary appearances (cervical catarrh, etc.) were so strongly pronounced in these very two cases, that the sperma which passes the narrow os is yet unable to advance to the ovum, while in the other cases no such consecutive obstruction existed. But at any rate the fact that in the first-named cases pregnancy occurred, does not justify us in saying that the stenosis of the os externum did not prevent conception in the last two cases. Another example: Here are two women; the one has a normal os and conceives five months after marriage. The other, who has a narrow orifice, but no other genital defects, conceives only after five years have elapsed. Should we now conclude that, because conception yet occurred, the stenosis could not have been the factor which prevented conception for so many years? The solution of the problem might perhaps be as follows: Suppose the sexual power of the two husbands to be equal and not very considerable; then in the first woman the few spermatozoa might succeed in entering through the wide os, and through the cervical canal, which is not plugged, into the uterine cavity. It is different with the other woman. Could we not believe that, since cohabitation is frequently performed, the amount of sperma that enters the vagina is also scanty, and the few spermatozoa either do not reach the external os at all, or perish in the cervical mucus; while after a separation of long duration, or after a longer abstinence dictated by other reasons, a greater amount of sperma is brought in contact with the narrow os uteri, and of this large number of spermatozoa, some may succeed in penetrating through the cervical canal? Consecutive disturbances or contemporary complications dependent or not dependent upon one another may, in combination with abnormalities in the generative power of the male, render it difficult to overcome the mechanical obstacles, while the isolated appearance of an obstacle together, with full potency of the male, may sometimes promptly overcome the difficulty. The same thing is true of other mechanical obstacles, especially flexions of the uterus

The effect of a stenosis in rendering conception difficult may also be proved by the contrary. Nobody denies that women who have been pregnant, all other conditions being normal, conceive much more easily than those in whom there has been no previous childbirth. It can scarcely be doubted that the width of the external os is the favorable factor with the first. But when a width that excels the lumen of the os externum of nulliparæ can bring about a plus of fertility, why should not a too great narrowness be able to have a minus as its consequence? But the obstructing effect of a stenosis becomes very strikingly evident in the cases in which, after prolonged duration of sterility, conception finally ensues; the pregnancies then generally follow in regular, sometimes even abnormal frequency—a sign that the former narrowness had a disturbing effect upon the process of generation. Some indeed do not deny the unfavorable effect of a stenosis, but ascribe the obstructed conception to the consequences of the stenosis. This is only partly true, for the promptness with which, conception ensues after removal of the obstacle, at a time at which the consequences can not have been nearly removed also, speaks for the unfavorable effect of the stenosis itself. Cases where, after sterility had lasted not for a short time, but for years, conception occurred soon after removal of the stenosis, are not rare, and would also speak in favor of the importance of this anomaly of the os uteri. But certainly the stenosis is not always the only cause of the sterility, but probably also the consequent plugging of the cervical cavity with mucus, which with its tough consistency often expands the canal into a spacious oval cavity and will scarcely allow the sperma to pass.

Acquired stenosis also may either affect the canal in its course to a greater degree, or at its beginning, the os externum. In the former case it is often with difficulty that even a fine probe can be introduced through the stiff canal, and sometimes it cannot be introduced at all; often the stenosis only begins in the middle of the canal, sometimes it is ring-shaped, sometimes valvular, recurring at several places. Very rarely one receives the impression as if the stenosis extended even beyond the os internum; sometimes it extends into the vagina, where the fornix is then included in the formation of a utero-vaginal stenosis. The origin of these narrowings of the cervical canal is various. Often it is a very difficult course of a labor, with or without instrumental assistance, where the long-continued pressure of the head or injuries have affected that part of the parturient canal, or it is severe inflammatory processes in childbed, that bring it on. But not infrequently considerable stenosis remains after deliveries, where nothing took place, either in the course of the labor or of the childbed period, that could have explained the severity of the stenosis. I have seen such cases repeatedly. Gonorrhœal infection also may produce stenosis of the cervix in addition to the changes in other parts of the genitals, that have already been shown to lead to sterility. Ring-shaped and valve-shaped stenoses are not infrequently traceable to it. In a case which I had the opportunity of treating, the husband had strictures of the urethra and the wife a considerable stricture difficult of removal in the vicinity of the internal os. While this disease plays an important *rôle* in the etiology of sterility, E. Martin again has gone too far when he ascribes sterility of the majority of young women to gonorrhœal infection. Still less near the truth is that well-known assertion of E. Noeggerath, according to which 90 per cent. of all cases of sterility are traceable to that disease which, according to his opinion, may for a very long time remain in a latent condition, and yet be active. Even if the unfavorable influence upon the generative power of the male be also considered, it is still at once apparent that a preformed opinion has here taken precedence of cool, impartial observation. Many also accuse an intense cervical catarrh as being a cause of sterility, inasmuch as it may be followed by stenosis. This is said to arise through a growing together of the folds that are opposite to each other, the plicæ palmatæ, or by cicatrization of ulcers that arise from the follicles. I am not acquainted with this form of origin of stenoses, but I have seen in two exquisite cases that a high degree of stenosis occurred from too long-continued and too intense caustic applications to the swollen cervical mucous membrane.

The changes that we have just mentioned may, however, if confined to the external os, easily produce an acquired stenosis of this opening alone. Even in nulliparæ with severe catarrhs we get the impression as though stenosis might be acquired not merely by a swelling of the tissues, but also by the formation of small cicatrices. The so-called agglutination of the os in pregnancy, the existence of which, however, has been lately questioned by Schröder, also would speak in favor of this manner of its origin. This is still more the case in women who have recovered from difficult labors and childbeds, or have for an extended period of time suffered from ulcerations of the vaginal portion. Healing by cicatrization may change the formerly wide os externum into an exceedingly fine opening. This form of origin of stenoses at the external os uteri can be watched most exactly in prolapse of the uterus. Operative interference also, resorted to for various purposes on the vaginal portion and the cervix, especially amputation of these parts, may produce a severe stenosis. Considering the frequency with which these operations are now undertaken, this possibility must also be mentioned. This danger is partly diminished by the care that is now taken in such cases to cover the open wound with normal mucous membrane, but this is not always possible, and if it is done, it does not always prevent stenosis.

It needs scarcely to be remarked that these various forms of acquired stenosis do not prevent conception, but render it difficult, the degree of the difficulty, other things being the same, depending upon the size and extent of the stenosis; however, the valvular stenoses seem to me to offer a much greater obstruction than those which are more even. A complicating catarrh and its consequences, which we shall soon discuss, may essentially increase the evil effect of the stenosis.

The experience of breeders of animals and of veterinary surgeons, that sterility in horses and cows not infrequently is traceable to a stenosis of the cervix, is of considerable interest. Thus General Daumas tells us in his work upon the horses of the Sahara, of an entire series of remedies which the Arabs use for the apparently not rare sterility of the "buttoned up" mares, and which consisted mainly in dilating the narrowed cervix with the hand or with some hard instrument. "Would it not be a peculiar fact if the Arabs had made a discovery so important for science?" Daumas adds in his report. Veterinary surgeons, especially the French ones, like André, Eleonet, and M. A. Collin, also found stenosis of the cervix and os to be a frequent cause of sterility. It speaks considerably in favor of the correctness of the diagnosis of this cause of sterility, that their manual attempts at dilatation were not infrequently successful. In cows also this kind of obstacle to conception does not seem to be rare. Thus Ph. von Walther called attention to the process which the Tyrolese peasants pursue, consisting in an artificial dilatation of the os uteri by incision, a proceeding which is said to have been followed by success. Furthermore M. Boaley, and especially Böhm and J. Fuchs, have found it necessary to undertake a manual and instrumental proceeding for dilating the cervix in these animals for overcoming sterility. It must, however, be remarked that these stenoses are chiefly acquired, generally by difficult labors with improper artificial assistance.

As for the frequency of stenoses of the cervix and of the external os in man, we must confess that some statements make us believe that too many intermediate conditions between normal and abnormal have been included as stenoses, and have been treated as such too early, the supposed favorable results having been looked at as proofs of the previous existence of an obstacle. It is a matter of course that the figures in regard to frequency thus attained were too high. This is an unfortunate fact which we meet again and again in all the works on sterility. Even physicians who are by no means fond of the mechanical theory of sterility state the percentage of stenoses as not very small. Thus Kehrer states the frequency of stenosis as an obstacle to conception as somewhat higher than 8 per cent. My own estimate is lower; only in 4 per cent. of all cases—in these of course there was considerable narrowing—have I deemed it necessary to adopt a therapy directed especially to the stenosis. Chrobak's figure of frequency is somewhat higher; he found the anomaly in somewhat less than 6 per cent. of his cases. Kisch puts it at 7 per cent., while Kämmerer found the anomaly in about 9 per cent. of cases. In 35 cases of the latter observer 24 had a stenosis confined to the external os, and only in 11 did he find the entire cervical canal stenosed.

Catarrh of the Cervical Cavity.—Chronic cervical catarrh is justly considered as a not infrequent cause of sterility. Its importance is the greater inasmuch as, like endometritis corporis uteri, it is an important complication of other anatomical lesions that cause sterility. But it may even obstruct conception when it appears singly. Even by a great hypertrophy of the mucous membrane brought about by a swelling of the plicæ palmatæ, by hyperplasia of the glandular elements, and above all by a cystic degeneration of the mucous follicles, a canal that is already narrow may be so plugged that it is rather difficult for a sound to penetrate. While under ordinary circumstances the sound finds difficulty only at the two ostia, passing very easily through the canal itself, in the cases mentioned it meets with a uniform resistance, much harder to overcome. The hand here receives the impression as if the sound was passing through a soft but strongly compressed mass. When even in the normal condition, the plicæ palmatæ are not very favorable for the advance of the spermatozoa, as we have seen in the physiological part of this work, this must be still more so in catarrh, when the projections tightly fit into one another. The obstacle, however, is greater when the walls of the cervix itself take part in the hypertrophy, whether they project into the lumen in the form of large knobs or folds, or whether they considerably compress the canal proper as a stiff mass; such is the case when at the same time a chronic metritis has attacked chiefly the cervical part. The obstacle is increased still more when polypoid excrescences arise upon the hypertrophied mucous membrane. If several are present, and unless they are soon protruded through the external os into the vagina, they may considerably increase the plugging of the already narrow canal.

The chances of conception are much more unfavorable in nulliparæ than in women who have already conceived. Here the os externum, which has been too narrow from the start, or has only been made so by the catarrh and its consequences, prevents the secretions from flowing out. Not only the glassy, semi-fluid, tough mucus, that is produced by the mucous follicles in large quantities, collects in the cavity, but there is often added to it the secretion of the uterine cavity proper. As this mass is produced more rapidly than it is voided through the narrow os externum, it not only closes but dilates the canal which, in turn, by its resistance, exerts a strong pressure against the tough mass of mucus, and thereby may render the advance of the sperma impossible. There have been cases in which a single removal of the mucous plug has led to conception.

But this collection of the secretion is not always the essential factor in the condition of sterility, as is seen by the fact that sterility is frequent enough in cases of wide os, in women who have borne children, in whom, therefore, the secretion can flow off. Evidence in favor of this is especially given by those cases of pronounced ectropium of the lips of the os uteri, for the cure of which Emmet has recommended the restoration of the cervical cavity by operation. Sterility here is not rare. In these cases the chemical condition of the cervical secretion also seems to have an unfavorable influence upon the sperma. We have already heard that the normal scanty secretion of the cervical cavity is slightly alkaline; according to the numerous, careful investigations as to the effect of chemical substances upon spermatozoa, it would, therefore, be a very favorable fluid for the preservation and onward movement of the latter; but when the production of mucus is copious, as occurs in catarrhs, the reaction of the secretion is strongly alkaline. During pregnancy, when there is a high degree of hypersecretion, as is well understood, those large, lumpy masses of mucus that come from the cervical cavity, were, according to numerous examinations made in the clinic of this place, also always found to have a strongly alkaline reaction. But since concentrated alkaline solutions greatly depress the motility of the sperma, the abnormal cervical secretion seems also to be able to prevent conception in a chemical way, by weakening or killing the spermatozoa. Perhaps the commingling of the abnormal secretion of the uterine cavity may also contribute to the effect.

Finally we must call attention to the fact that a profuse uterine secretion may simply wash away the sperma. Although this seems plausible, we must remember that in animals, when they are in heat, the fluid is poured out of the cervix in quantities by no means small, and that in them it does not at all obstruct the advance of the sperma.

It is a known fact that catarrhs of long duration cause a relaxation and softening of the walls of the uterus, (first stage of chronic metritis); hereby the uterus loses its stiffness and the body of the uterus easily becomes flexed. By this flexion, which may sometimes be extreme, a stenosis of the internal os is superadded as a further obstacle to conception.

It is not possible to make a reliable statement in regard to the frequency of cervical catarrh as an obstacle to conception. This affection occurs so often, and is so common a companion to other genital affections, that it is very difficult for physicians to distinguish accurately the cases in which endometritis colli chronica is the cause of the sterility from the others. I therefore desist, as in all genital catarrhs, from giving any doubtful statistics.

Neoplasms of the Cervix Uteri.—All neoplasms that may occur at the cervix uteri may under certain circumstances render conception more or less difficult. In speaking of catarrh of the cervix, we have already become acquainted with the mucus polypi that arise from it. These may, regardless of the endometritis cervicalis that caused them, by their number and size produce a plugging of the cervical cavity, or may stop it up by filling the most narrow part of the canal at the external or internal os. These formations have been demonstrated upon the cadaver as causes of sterility by several authors, especially by O. Achtermann. A similar obstruction is formed by the fibrous polypi that start from the walls of the cervix. They extend the cervical cavity, so that the walls surround the tumor more tightly, and thereby the lumen of the cavity is diminished. Though in such cases the co-existing hyperæmia and softening of the walls of the cervix causes the latter to be less tense, yet the very fact that the cervix is diseased, would alone suffice in rendering conception difficult.

A similar influence is exerted by tumors that start from the uterus, but descend into the cervical cavity. Fibromyomata of the cervical wall occur rarely; they also may obstruct conception by greatly distending the walls of the cervix, and thus closely approximating them, so that the sperma cannot easily move forward through the very narrow slit thus produced. It is probably a rare occurrence that several tumors compress the canal at the same time from different directions, but it happens somewhat more frequently that the canal is pushed aside by the tumors within the walls or outside of the uterus, and that thereby a similar result is produced.

Among the important obstacles to conception, carcinoma of the cervix is also mentioned, and I believe justly so. When the neoplasm has advanced to any degree, even if confined only to one wall, the cervical canal is mechanically stopped up, and if ulceration has once begun, the corrosive fluid will exert a deleterious influence upon the sperma. The relative frequency of carcinoma uteri among rather young women on the one hand, and the very rare occurrence of pregnancy with this disease on the other, speak decidedly in favor of this view. Now since the first stage of this disease remains almost latent, or only manifests itself in the first months by profuse menstruation, therefore not by any characteristic sign, and since, furthermore, there has not yet taken place a tædium cohabitationis on the part of the husband, pregnancy ought to occur much more frequently, if carcinoma could not even in its beginnings prevent conception. In the cases where advanced carcinoma is found during labor, we must, considering the relatively short duration of carcinoma uteri, take it for granted that conception took place when the new growth had not yet ulcerated, and that the strong congestion determined its earlier decay. In the few cases that I have seen, the new growth had advanced so little, that it could certainly only have developed itself after the beginning of pregnancy. Cohnstein's collection of 127 cases of labor complicated by carcinoma, among which he found not less than twenty-one in whom the new growth was said to have existed for a prolonged period of time (even as much as a year), seems to contradict this opinion. But as the duration of the carcinoma is relatively short, it can only be that at the occurrence of conception the new growths had advanced but little, and had not yet ulcerated. The question of the influence of carcinoma upon conception is a purely theoretical one, and, with the serious course and short duration of the affection, lacks all practical significance.

The frequency of new growths that lead to sterility is not great; it seems that the polypoid excrescences form the majority of them, as indeed they arise from one of the most frequent diseases of the uterus, *viz.*, catarrh.

Flexions of the Uterus.—Conception may be rendered difficult by a flexion of the uterus. This pathological condition in the majority of cases, implicates the narrowest portion of the uterine body, *viz.*, where normally the inner walls are in simple approximation, they become firmly compressed, thus producing a stenosis of the uterine canal. The production of this stenosis is readily demonstrated in a uterus removed from the body. If a vertical section through the centre of the organ be made, it will be seen that the os internum is the narrowest portion of the uterine cavity. This is specially well seen in the virgin uterus, where it is covered by a thin mucous membrane, the opposing surfaces of which lie in apposition. If the fundus and cervix be now grasped between the fingers, and the uterus doubled upon itself, the os internum will be caused to disappear. This obliteration of a portion of the uterine canal by flexion, explains the difficulty in making an injection in this condition, which fact I had specially pointed out at the time of M. Sims's publication on Uterine Surgery. If a horizontal section of the uterus be made, so as to expose the cavity, fluid can, under a slight pressure, be caused to pass readily through the os internum, which is not the case on producing an artificial flexion; here strong pressure is requisite to force fluid from the cervix into the uterine cavity, or *vice versa*. Although the results of these experiments were such as were to be expected, yet they hardly apply to the passage of the semen. Still, they serve to demonstrate what obstacles such an easily penetrating substance meets with under such abnormal conditions.

It is a well-recognized fact that sterility is a common accompaniment of the various forms of flexions. Indeed, various authorities have even given figures, and claimed that a rather high percentage of sterile women have an existing flexion. Yet these figures are not reliable, since their authors have not sufficiently well discriminated between flexions and versions of the uterus. They have likewise, on the one hand, paid too little attention to the existing complications, and, on the other hand, they have tabulated the results of their researches before it was positively known what the normal position of the uterus is. This latter fact especially, in addition to the conclusions recently arrived at, that many of the so-called causes of sterility are not really such, but that the true cause lies much deeper, have done much to upset the once so strongly accepted belief that flexions were frequently the cause of sterility. As an etiological factor in the production of sterility, no abnormal condition of the uterus has sustained such a reverse in the opinion of the profession as the flexions of this organ. When Marion Sims, in his day, demonstrated in such a clear and perhaps too simple a manner, the mechanical obstruction to conception, which, according to him, existed more frequently in the cervix, he met with the approval of not only the majority of gynecologists, but also with that of his numerous followers in this peculiar line of mechanical treatment. It is not to be denied, that flexion as a cause of sterility has been very much over-estimated, and that the application of the recommended mechanical treatment has been followed to an unjustified degree. Soon a falling off from the extreme position occurred, and the belief gained ground that flexion was not a cause of sterility. This revolution was incited by Scanzoni's criticism of Sims's theory of sterility, and was largely supported by B. Schultze's teaching of the normal position and form of the uterus. It has so far advanced that many attach no importance to flexion as a cause of sterility, but rather ascribe the source of unproductiveness to conditions existing outside of the uterus, as a parametritis, perimetritis, oöphoritis, etc.

Without in the least adopting the rather one-sided opinion of Sims, I cannot agree with those who hold that flexions are in no way connected with sterility. The arguments which have been brought forward against the mechanical theory, as far as flexions are concerned, I consider neither unanswerable nor convincing. Thus it is claimed that the semen traverses a tube the calibre of which is smaller than that of a stenosed os internum, since it passes through the Fallopian tube at every conception, although the calibre of this tube in its passage through the uterine wall is very small. This comparison between a stenosed os internum due to a flexion, with the uterine portion of the Fallopian tube, in my opinion is entirely inadmissible. The tubes have in reality no true lumen, being in this respect like the os internum under normal conditions—the walls lie in contact, yet this contact is a gentle approximation only, there being no pressure brought to bear to produce a strong compression of the opposing walls. It is not so with the stenosis produced by the flexions; here, because of the extreme degree of flexion, together with the greater firmness of the uterine walls, these walls are strongly compressed at the point that is normally of the smallest calibre, and as this compression extends for some distance up and down beyond the isthmus, it becomes, even for microscopic organisms difficult, if not impossible, to pass into the uterus, whereas when no such obstacle exists, they very readily enter the uterine cavity. Still less acceptable is the objection that where the menstrual blood can pass out, there the semen can enter. This statement is not correct to begin with, even overlooking the fact that various portions of the body are so constructed as to allow fluid to pass in one direction, but this same fluid cannot pass in the opposite. The propelling forces which drive the fluid through a constricted canal, must also be taken into consideration. The blood, which through the action of the heart, is poured into the uterine cavity, distends its walls, and this distension, together with the existing flexion, produce uterine contractions, a by no means small force. Thus the resistance offered by the stenosed os to the exit of the menstrual blood can be overcome. When the blood has once passed the constricted portion, its own gravity will suffice to carry it on through the cervical canal. The semen is not thus favorably endowed with forces; it must, against gravity, pass over this extended barrier by its own inherent power, having no *vis-a-tergo* to favor its propagation. That the semen is thus in every way handicapped in comparison to the menstrual blood, is quite evident.

It is likewise inadmissible, that when a sound can be inserted by the flexed portion, the semen should also be able to pass through. Disregarding the force which we employ in manipulating the sound, in comparison with the forward propelling force, with which the spermatozoa are endowed, it is necessary to keep in mind the fact, that it quite often happens that we fail to introduce a sound through a constricted os, or only accomplish it after many attempts and by the aid of external manipulation, factors which do not hold either at the time or after cohabitation.

The frequency with which sterility occurs, in simple uncomplicated stenosis of the os internum as a result of flexion, is a strong argument in favor of its being the cause of such sterility. It seems to me the assertion is hardly tenable which considers that many of the cases of sterility said to be due to anteflexion were purely instances of normal flexion. If we study more closely what B. Schultze, to whom we are indebted for this new view, has described and pictured as the normal position, and a correct form of the uterus, then we are compelled to admit that this is an anteversion or possibly an antecurvature, in no sense, however, an anteflexion to the amount of 90°. I doubt very much if what Schultze calls a normally placed uterus, has been so frequently mistaken by expert examiners as a pathological anteflexion. For, although I have latterly removed from the list of anteflexions all those cases that Schultze would not admit, yet the number of anteflexions forming an acute angle among my cases was not diminished. There yet remains a by no means small number of cases, that have to be placed under the category of acute angled flexions.

I further believe that the error is often made of making the accompanying complications of flexions the cause of sterility, rather than the flexions themselves. It is indeed true that pathological conditions in the pelvic cavity are often accompanied by flexion of the uterus. It is also correct to seek in these conditions the cause of unproductiveness, even as we do when they are unaccompanied by a flexion. Not rarely upon a closer examination, specially when made under chloroform, which I use quite often in cases of sterility, there are found freely movable, unchanged ovaries, replaceable uterine body, and absence of exudation and thickened bands. In fact in those cases in which the anteflexion is most marked, the angle found being less than 90°, but where the anterior portion of the vaginal portion of the cervix is retroverted, the flexed portion of the body of the uterus resting on the anterior portion of the cervix, a condition frequently met with in virgins, there may be no evidence of a complicating inflammatory process in the vicinity. The instances in which no discoverable change exists in the pelvic cavity, as a cause of the sterility, and those where there is stenosis the result of flexion, through which a sound can not or only with difficulty be passed, cannot with justice be classed together.

Even, however, those cases in which complications are present do not rob the flexions of all importance, as where, for instance, there exist catarrhal inflammations of the cervical and uterine mucous membrane.

Even in the cases of anteflexion, which we rightly consider congenital, and in which there is otherwise no abnormality in the pelvic cavity, an aggravated form of catarrh of the mucous membrane is developed. This endometritis is not entirely harmless for production, indeed it alone may act as a very serious check to conception. At present we are compelled to trace back the source of trouble to the flexion. If the unfruitfulness is not directly dependent on the flexion, it is still on the altered condition brought about by this flexion, or, as is most likely, it is due to the combination of both anomalies, the primary as well as the secondary. The importance of flexion, as an originating cause of sterility, as also the importance of the consequent therapeutic measures, are not to be denied.

It has been doubted whether the success resulting from mechanical treatment of the uterine flexion can be taken as an argument that the stenosis resulting from flexion was the obstacle preventing conception. Mistakes are not improbable, since impregnation can take place in the presence of flexion, without any treatment having been instituted. Although this is true, yet it does not justify a universal scepticism as regards the condition. When after a prolonged period of sterility, which has extended beyond the general latitude of human sterility, conception follows upon a mechanical course of treatment, the physician is justified in attributing the result to his therapeutic efforts. Every busy gynecologist has surely met with such cases. The mere introduction of only a sound has often been followed by a happy result. Thus in a case of anteflexion with a period of sterility existing for five years, the sound having been passed by the stenosis, conception ensued; again in a case where sterility had lasted for twelve years, during the examination the sound was with difficulty introduced, when after an interval of four months, the patient again presented herself, and one of my assistants found a uterus as large as a fist, that is to say, a gravid uterus of about three months. Usually, however, conception only takes place after a long and energetic course of treatment. I will cite but two cases.

Mrs. S., twenty-nine years of age, married eight years, sterile, anteflexion of the uterus. She was treated for six weeks with dilating instruments, no cutting operation was performed, and finally she was discharged after the insertion of a pessary. It was removed some weeks afterwards by her physician. Conception ensued.

Mrs. Sch., aged thirty-eight years, married eighteen years, anteflexion of the uterus, sterile. Treated nearly for two months after the same manner. When treatment ceased, menstruation occurred but once, as she immediately became pregnant.

The promptness of the success is noteworthy. Even M. Duncan, who is one of the most determined opponents of the mechanical method of treatment, relates the history of two patients, in one of whom sterility had lasted fifteen years, and in the other twenty-two years, where conception occurred as the result of mechanical treatment. I am not a mathematician, who can by calculation determine the causal relation existing between conception and mechanical treatment. But it must be considered as remarkable that, after periods of sterility of eight, thirteen, fifteen and twenty-two years, directly after dilatation of the stenosed portion conception should take place. If cases such as these do not serve to convince, then our therapeutic efforts must be limited within narrow bounds indeed.

Even the arguments of the opponents of mechanical treatment are only apparently of force against flexion as obstacles to conception. Thus cases have been reported in which, although extreme stenosis was present, impregnation had yet occurred. These cases would be convincing, if it had been asserted that flexion entirely prevented conception, but such is not the case. It is only asserted that flexion renders conception somewhat more difficult, and not that without our interference conception cannot take place. This is apparent in many of the cases reported by Scanzoni in opposition to Sims's teaching, and he thus rather supports than undermines the latter's position. Such cases plainly go to show how long it will take until favorable circumstances are developed for conception to occur. Moreover it would have been an easy matter for Scanzoni to have drawn from his ample experience, for every favorable case, a dozen others where, after a still longer married state, permanent sterility was present, for it is not to be gainsaid that where a true and extensive flexion exists, sterility is the rule, and an early conception the exception.

As is apparent from these considerations, I do not think that our present knowledge of flexion justifies us in setting aside its importance as an obstacle to conception. Recent investigation has determined what the normal position and form of the uterus are. Yet it has not solved the problem why in many nulliparæ shortly after puberty, and without any sign of a diseased condition in the pelvic cavity being discoverable, a uterus normal in size is found, the body and cervix of which are in contact, because of an extremely developed flexion, and where considerable effort is requisite before the sound can be passed into the uterine cavity. Now if sterility of a number of years standing exist, all other concomitant circumstances being favorable, why should not this stenosis be regarded as the preventing cause and be treated as such? And should not this be also allowable when, under otherwise similar circumstances, the cervix is found retroverted with the fundus resting on its anterior surface, so that the flexion is still more marked, and the obstruction to conception still greater? One is strongly tempted to ask, is this still a normal condition of the uterus, and is this appearance not to be considered as rather pathological, even when the posterior parametritis is not present? Although in many cases inflammatory processes in the pelvic cavity undoubtedly induce sterility, and although this is even proven to be so in cases of existing flexion, what is to hinder us, when a woman, after naturally bearing children, remains sterile for a number of years, and a marked anteflexion or retroflexion has been developed, in regarding this as the cause of sterility, rather than the results of an obscure pelvic cellulitis or pelvic peritonitis, which are by no means essential for the production of flexions? It seems to me that as long as true cases of flexion exist, whether they be the so-called congenital or acquired, and where sterility obtains, and yet there are no determinable existing complications, flexion must be admitted as the obstacle to conception, and if complications occur, then stenosis must not be entirely disregarded since experience has shown that after the complication has disappeared, stenosis and sterility may still persist. This latter fact is of considerable importance in connection with treatment. All stenoses resulting from flexions are not, however, of equal importance, and this depends on various circumstances.

It is important in this connection to consider the conditions existing at the angle of flexion. In many cases of so-called flexion, there is simply a bending of the anterior or posterior uterine wall. The vertical axes of the cervix and body of the uterus merge into each other at the os internum. When the body of the uterus lies forward we then have purely an exaggeration of Schultze's normal position, that is only a transitional stage to the corresponding version, a condition that would be best designated as a curvature, and not as a flexion. In other cases an angle is present, but it is obtuse, being greater than 90°, and this also represents only the transition to a normal position. In case of these changes in shape, conception is rendered more difficult, but they are not to be considered as pathological flexion changes. The sharper the angle in the latter cases, however, the more likely sterility and the longer the interval before conception ensues. Further, it is of importance as to whether the flexion is present in a nullipara or in a parous woman. If an equally well-marked flexion exist in both, conception is a little more apt to occur in the latter. This is probably due to the fact that the uterus having once been distended, the os internum is larger and stenosis consequently less marked. The spermatozoa can more readily hence enter the uterus; and further in the latter case, the cervix having undergone a process of softening, it is therefore less resisting and the stenosis more easily overcome. An essential obstacle to conception in a case of flexion is further offered by changes in position of the cervix. This is specially the case with anteflexion, where (with or without a previous posterior cellulitis having existed), as has already been pointed out, the cervix instead of pointing downwards and backwards is directed forwards. Here the angle of flexion is very acute, and stenosis is extremely marked. Of importance also is the complicating endometritis, which soon follows on flexion of the uterus, if it does not already exist, or has been acquired, as is frequently the case.

In addition to the stenosis there is also present a mechanical and chemical obstacle in the cervical canal, or when the semen has found its way past the os internum, the impregnated ovum does not find a suitable soil for its further development. The most important complications are pelvic cellulitis and pelvic peritonitis, in particular their residues. They are especially liable to bring about a change of form in the acquired cases of flexion. They are likewise an effective obstruction to conception, as has already been pointed out, and often are also the cause of the failure of the mechanical course of treatment. To consider these processes, however, as the sole causal factors of the sterility, I think from the above considerations is not warrantable. In many instances the stenosis accompanying the flexion is more marked at different times. Thus there are cases in which the uterus, as the result of marked relaxation, becomes strongly retroflexed, and then after a short time this changes into an anteflexion, and further alterations of flexions into versions may be met with. Of greater importance, however, is the overcoming of the stenosis at the menstrual periods. There is no question that during menstruation, or immediately before or after it, the uterine sound can be more readily introduced than in the inter-menstrual periods. This is probably due to enlargement, resulting from the congestion with the consequent erection of the body of the uterus, by reason of which the angle of curvature is diminished, and the flexion temporarily rectified; but it is more probable that because of the softening of the stenosed portion, the pressure of the uterine walls is less, and at the same time a dilatation of the canal takes place, as is the case in pregnancy where there is great congestion and serous infiltration. It is essential to take this temporary relaxation into account in the course of treatment.

Of the different varieties of flexion, the congenital anteflexion is as frequently accompanied by sterility as the rarer retroflexion of the nullipara. Even P. Grenser, who has specially studied the latter variety, concedes this point as regards the frequency of sterility. In my experience, as regards the unproductiveness resulting from flexion, I find that conception occurs least frequently with anteflexion, and not with retroflexion, where it occurs more frequently, even as in the corresponding version. The rare congenital lateral flexion has always been considered as a cause of sterility—at least this condition has been found relatively frequent in sterile women, both during life and at autopsy. As regards acquired latero-flexion, which has recently become better understood, insufficient data exist to warrant an opinion. Concerning the worst change of form in the uterus, inversion, it is self-evident that conception cannot take place when this is even only moderately marked. Even if the semen and ovum come into contact, which is possible when only a slight degree of inversion exists, yet the accompanying conditions are not conducive toward further development. In only a single instance (Dibardes) was impregnation followed by a cure of the inversion, and here the possibility that a spontaneous reduction of the inversion occurred before conception is not ruled out.

Reliable statistics of the changes in shape of the uterus, as regards sterility, are as yet difficult to formulate, the old statistics, which include many cases of curvature and of normal flexion, making the percentage of flexion too great. Still flexions are responsible for sterility in a fair proportion of cases. It seems to me that the figures which Leopold Meyer gives, are very near the truth. As the result of the examination of many infants, he has determined the normal position of the uterus, and considers an angle of flexion from 140° to 160° to be normal, and in 227 cases of sterility he found 21 instances of primary and 24 of acquired anteflexion, and 4 of primary and 26 of acquired retroflexion. Judging from the material at my disposal, which exceeds that of Meyer, although I am unable to give a detailed classification, since I cannot separate the pure cases from those with complications, the primary anteflexions are comparatively more frequent than the acquired; as regards the comparative frequency of retroflexion, my tables are incomplete. I think that many of these cases, even as are many acquired anteflexions, have been classed under the chronic inflammations which often complicate these flexions. The other deviations in form of the uterus are, because of their rarity, discarded in statistics.

Displacements of the Uterus.—Less important for reproduction are the versions of the uterus, which I, in contradistinction to B. S. Schultze, sharply differentiate from the flexions; since in the former, although there is marked change in position, there is yet no change in the lumen of the uterus, in the latter in addition to change of form, there is the above-mentioned stenosis of the genital tract. That both anomalies, so distinctly marked in their pure form, may shade off into one another, and even into the normal uterus, has already been referred to and emphasized. The obstacle caused by version to conception, consists in rendering the entrance of the semen into the os externum difficult. The vaginal portion is displaced from its normal position either forward, backward, or laterally, so that the ejaculated semen is not directed toward the external os. Where the uterus is firm and there is marked displacement, the os becomes pressed against the wall of the vagina, so that if this canal is also rigid the os is practically closed. These conditions are certainly of importance in instances where cohabitation is incomplete, *e.g.*, as where the semen is of insufficient quantity and quality. In proportion as the semen is thrown near the os uteri, so *ceteris paribus* conception may be expected. M. Sims has further pointed out the fact that the semen more readily flows out where there exists a version, although this is less likely to occur when closure of the vagina is perfect. Sterility seems to me to be more dependent on the complications in versions than is the case with flexions. The versions are more frequently developed after childbirth than are the flexions. The pathological changes, which follow in consequence of the puerperal state in the uterus and its surroundings, are capable of producing displacements, but are also of themselves sufficient to serve as obstructions to conception. It is of no little importance to point out the fact that, perhaps through a displacement of the uterus, dislocation of the other internal organs of generation may be brought about, and the tubes and ovaries be so far separated from each other as to render conception unlikely. The greater ease with which untoward conditions to conception are overcome in women who have already borne children, and for reasons which we have studied under flexions, is also apparent in case of versions. With the congenital form of retroversion, which is comparatively rare, sterility is frequently found, as may be seen from the writings of P. Grenser, while in acquired retroversion, a very common form of displacement in women who have borne children, pregnancies follow one another at about the usual intervals.

In case of latero-positions, even more than in versions, para- and perimetritis and their remnants, which cause them, are of great importance. As regards these changes in the position of the uterus, my experience points to the retro-positions as the most frequent, especially in women who have borne children. As exciting cause we may cite not only Schultze's posterior parametritis, but more frequently the peritonitis involving Douglas's pouch. The uterus appears to be in good position, but is still fixed to the posterior pelvic wall. Even here there are gradations up to a well-marked flexion. Occasionally such women will come to be treated for sterility, but they consult the physician on account of other symptoms. I have found, and I wish to emphasize this, that frequently a number of years have passed since the last confinement, and this strongly points to the fact that the displacement tends to favor sterility.

Prolapsus uteri less frequently produces sterility than we should expect, considering the amount of displacement and the accompanying affections. The obstacle to conception is absolute only when there is present a complete and irreducible prolapse, the protruding portions being suspended between the thighs like a bag. In case of an incomplete but irreducible prolapse, if we accept as true certain reported cases, then the direct introduction of the penis into the os uteri has been followed by conception. As a rule, when the prolapse is but slightly marked, the uterus retreats when the woman assumes the dorsal decubitus, or it can then be easily reduced, so that cohabitation takes place under nearly the normal circumstances. On account of the changes which the uterus undergoes owing to prolapse, and also on account of the at times well-marked metritis and uterine catarrh, conception can be rendered difficult, especially since with prolapse the vaginal portion is apt to become ulcerated, the cervix hypertrophied and furthermore the internal organs are all dislocated. Still these conditions would seem all to be nullified by the increased size of the os uteri and cervical canal, for it is a fact, that pregnancy takes place more frequently than would be expected. That a simple descent of the uterus should be a greater obstacle to conception than a true prolapse, as Beigel asserted, basing his statements on theoretical considerations, cannot be true, and a great many women who present themselves with a prolapse for examination, date the beginning of their trouble to a period prior to a number of deliveries. Even if the beginning is simply a prolapse of the vaginal walls, the uterus must have descended lower, or in other words descent must have existed. Yet conception follows. It looks as though the descent towards the introitus of the os externum favors conception.

Hernia of the uterus, where either this organ alone or others with it, are found in a sac, occurs so infrequently that the material at command is insufficient to warrant a just conclusion regarding its relation to conception, but it should be noted that in nearly one half of the recorded cases pregnancy ensued, notwithstanding the marked dislocation of the uterus. Perhaps this is to be explained on the assumption that the vaginal walls form a funnel-shaped cavity, directed towards the dislocated uterus, and that thus the semen is directed towards the external os. I can thus, at least, account for Scanzoni's case, and for the one which I noted where pregnancy complicated an inguinal hernia of the uterus.

Even as with flexion, so it is the case with the older reports concerning version, that for determining their relative frequency as obstacles to conception they are unreliable. This is specially true of anteversion. Leopold Meyer has found among his 227 cases only 3 primary and 7 secondary anteversions, to which must be added a number of instances where there were other complications. In addition he found 11 cases of acquired retroversion, including complicated cases. I cannot compare these figures with my results, as many cases of anteversion are with difficulty differentiated from cases of chronic metritis, and it is further difficult to separate retroversions from retroflexions.

Diseases of the Body of the Uterus.—A by far smaller group of diseases than the affections which we have studied in connection with the cervix, can, starting from the uterus, interfere with the process of generation, but in their final results they seem to surpass the first It is especially the inflammatory processes which are here considered, and chiefly the inflammations of the mucous membrane of the uterus. Chronic endometritis is all the more important as a cause of sterility, since it is a very frequent accompaniment of genital affections. Even as many of these alone may serve as a cause of unfruitfulness, so their action may become intensified by the addition of the catarrhal inflammation. On the other hand, individual affections, which otherwise could not interfere with conception, can by this combination act as a cause of sterility.

The manner after which sterility is produced is undoubtedly different. The swelling of the mucous membrane cannot, where the uterine cavity is spacious, and where the walls are in simple approximation, offer a mechanical obstruction to the forward movements of the spermatozoa; but it is necessary to query if the morbid secretion, like that of the cervix and vagina, may not from its chemical nature have a deleterious effect on the semen. The secretion is often decidedly purulent. It is not impossible that it acts as does leucorrhœa, since its constitution is similar. It is questionable if the secretion may be so profuse as to simply wash away the spermatozoa. It is generally the fact that this secretion is much less in quantity than that of the cervix and vagina.

It is the universal opinion that in chronic endometritis the sterility is not due to any mechanical obstruction which prevents the migration of the semen, but that the impregnated ovum upon entering the uterine cavity does not find in the degenerated mucous membrane the proper soil for its growth and further development. We have not to deal, therefore, with a sterility in the true sense of the word, since the ovum has already become impregnated, but only with an *impotentia gestandi*—that is to say, the ovum is unable to develop. Still the shedding of the ovum occurs so soon, so shortly after conception, and generally without symptoms, that it is hard to say in the majority of the cases whether the one or the other is the cause of the sterility, and since the anatomical cause and the directed line of treatment are alike, this *impotentia gestandi* is to be considered the same as sterility.

This non-fixation of the impregnated ovum is to be sought in a deeply seated change in the mucous membrane. Pathological anatomists and clinicians who have exhaustively studied this condition (of the former I would especially mention Klob and Klebs) are agreed that the uterine mucous membrane is at first more swollen and secretes more, and that in protracted cases the condition changes from the hyperplastic to the atrophic. The mucosa of the uterus is increased in thickness, becomes smooth, the glands become cysts or degenerate, and the cylindrical epithelium assumes the squamous form. The secretion becomes diminished in quantity, and the menstrual flow is scanty. The mucous membrane is not in a condition, upon conception, although there is a strong flow of blood to the genital organs, to develop into a rapidly growing decidua, so that the impregnated ovum on its entering the uterine cavity does not fix itself within the folds of the mucosa. In consequence of the existing smoothness of the cavity and its capaciousness (*i.e.*, in the simple approximation of its walls) the ovum glides down through the uterus and miscarriage occurs. The process is about like that which we consider as happening in cases of placenta prævia, with the exception that in this case the ovum becomes fixed at the os internum. Since placenta prævia occurs mostly in multiparæ, where the uterus has lost tone because of the many preceding pregnancies, this explanation is justified. Undoubtedly in such a condition as this, sterility becomes the rule and pregnancy the exception. This is explained in the same way as is abdominal pregnancy. The peritoneum, to which the atrophied mucous membrane bears a strong resemblance in its microscopical structure, is not adapted for the reception and nourishment of the ovum. Were this not the case, then an extra-uterine pregnancy would naturally be more frequent, since the supposition is warranted that many impregnated ova, on account of insufficient conduction, do not reach the tubes, but wander into the peritoneal cavity, and here under favorable, though seldom occurring circumstances, develop. That these favorable circumstances, in case of uterine disease, are to be explained by the fact that the whole mucosa does not atrophy, but that isolated portions may remain intact, can be formulated, but so far as I know this has not been demonstrated anatomically.

The atrophy of the mucous membrane is, however, but the result of a chronic inflammatory condition, and has been preceded by a period of chronic hyperplasia of the mucosa extending back for years. Even in this stage many women remain sterile, although not so frequently as in the second stage. The excessive menstruation which occurs during this stage, the frequent abortions that take place in the early months of pregnancy, are only explainable as due to the excessive hyperæmia, and this leads one to suspect that, even in the sterile, abortions at the beginning of pregnancy are caused by the severing of the loosely attached ovum. In addition to this is the condition that, as is the case in all catarrhs, in endometritis a constant shedding of the superficial cells and layers of cells takes place—that is to say, a throwing off of the very elements which in the beginning should surround and embed the impregnated ovum. That the possibility of a longer sojourn of the impregnated ovum in the uterine cavity largely decreases, and the probability of the continuance of the sterility increases with the greater development of the affection, is self-evident. For this reason, in women who have been for a longer time sterile, and suffering from a chronic catarrh, do we so frequently find after dilatation of the cervix a marked endometritis, which either manifests itself as a diffuse decidua-like hyperplasia of the mucous membrane, or else by the presence of many polypoid growths or excrescences, an affection to which in its worst form has been applied the name of adenoma of the uterus.

That these affections of the interior of the uterus can indeed prevent conception, is proven by the results obtainable from treatment of chronic metritis, and it frequently has happened that women conceive even though they have no desire for children. This has also been witnessed by other observers, and I need only refer to the discussions of the Berlin Obstetrical Society in this connection.

With this endometritis there is not seldom associated a pathological condition of the walls of the uterus, known as chronic metritis. I am not of the opinion that this affection is as common as is generally represented. I do not belong to those who ascribe every disturbance of the genital track, for which they can not find a pathologico-anatomical cause, to chronic metritis, but I do believe that the most important part of a chronic metritis is the seldom absent endometritis. Nevertheless, the obstacle to conception due to the catarrh is considerably increased by the accompanying inflammation of the muscular wall of the uterus. The catarrh and the afflux of blood, because of the hyperæmia which characterizes the first stage of the disease, are sustained and favored, while on account of the rigidity of the walls which accompany the second stage, the induration through the diffuse development of connective tissue, the dilatability of the uterus is lessened, and the further development of the ovum in the uterine cavity is rendered impossible.

Although now there is no doubt that the chronic catarrh of the uterine cavity, with or without the chronic metritis, in one way or another produces sterility, and even if it is likely that this happens quite often, still, according to my opinion, it is not justifiable to say that sterility, in case of chronic catarrh of the cavity of the uterus, entirely depends on the unfitness of the mucous membrane for the fixation and nourishment of the ovum. Seldom is this catarrh the only thing present. Cervical catarrh is in my opinion very frequently combined with it, and because of the disposition of genital catarrh, not only gonorrhœa, to spread over the whole extent of the canal, salpingitis is not a rare accompaniment. These complications alone are sufficient to prevent the contact of the semen and ovum, aside from the sequelæ of the catarrh in the surroundings of the uterus, which, as we have shown, are of themselves sufficient to cause sterility.

I cannot further grant that chronic metritis, whether it be primary or a result of other genital affections, can cause, to such a marked degree, sterility. Even when we reckon the abortions occurring during the early months as cases of sterility, we can not deny that in a by no means small percentage of cases, in which, both by an examination and from the train of symptoms, we are justified in making a diagnosis of chronic metritis, occasionally one and sometimes successive births take place at the end of full term. This fact, which is assented to by all unprejudiced observers, should warn against over-estimating this affection as a cause of sterility. We are again thus reminded that in chronic metritis, even as in other affections accompanied by sterility, the cause is not to be sought for in one, but rather in a number of conditions. In addition, at least in my opinion, the fact must be borne in mind that sterility is frequent in women who have never conceived, and yet that chronic metritis is only exceptionally met with in them. True enough this condition is often diagnosticated in nulliparæ—I need simply refer to Grünewaldt's work; but whoever has had occasion to treat such cases of chronic metritis will agree with me that the diagnosis is frequently based on the subjective symptoms of the patient rather than on any proven change in the uterus. These facts, to which many others might be added, are calculated to sustain the recently advocated view, that unproductiveness in the female depends more on an *impotentia gestandi* than on an impossibility to conceive.

These views can only be accepted as an expression of the strong reaction against the theories of Sims regarding the frequency and importance of the causes producing sterility. It is also true, however, that Grünewaldt, in his endeavor to do away entirely with mechanical hindrances to conception, has gone to the opposite extreme. No one has perhaps better judged the importance of chronic metritis on conception as another determined opponent of Sims, Scanzoni. In his work on chronic metritis he expresses himself very carefully in regard to the influence of disease of the parenchyma, and considers the absence of conception as due to purely mechanical conditions existing in the neighboring canals and organs. On the other hand, Beigel, the enthusiastic interpreter of Sims's views, has taken the opposite view, and through his anatomical studies of the numerous obstacles to conception, as they exist outside the uterus, he has deprived both theories of their extreme one-sidedness.

Closely related to endometritis as a cause of sterility, there is a further factor, the so-called *membranous dysmenorrhœa*. The incapacity of the uterine cavity to receive and further develop the ovum is here very evident. Sterility has here been explained on the assumption that the impregnated ovum, which has attached itself to the mucous membrane of the uterus, is cast off with the shedding of the mucous membrane of the uterus at the next menstrual epoch. (Beigel.) Yet, in this explanation the author is oblivious of the fact that, after impregnation has once taken place, menstruation ceases. It is possible, however, that the hyperæmia resulting from conception being superadded to the tendency of the uterus to exfoliation of the mucous membrane leads to an abortion, and that this may be mistaken for a timely or a somewhat retarded menstruation. It seems more probable to me (at least in those cases where a shedding of the mucous membrane occurs with every menstruation) that the mucous membrane is thus constantly rendered unfit for the reception of the ovum. Endometritis exfoliativa is decidedly an obstacle to conception. As pregnancy is but seldom noticed, probably this is only possible when the membrane is shed only at longer intervals, and impregnation occurs in the early part of the interval.

Even more than an incomplete involution of the puerperal uterus, which is a frequent cause of chronic metritis, can a hyper-involution of this organ affect the generative process. This condition, called puerperal atrophy, occurs more often than is generally supposed. I have recently seen a large number of cases of this kind, not considering those cases that approach the normal. Among the almost never absent symptoms may be reckoned sterility. Whether the condition of the lining membrane of the uterus is the cause of this is hard to say at the present time, as we do not thoroughly know what the exact condition of the endometrium is in this affection. According to my experience a cure can be effected by treatment, and conception can again occur. This was the case with a patient who, after the birth of twins, developed a decided atrophy of the uterus with pronounced objective and subjective symptoms, and who again became pregnant one and a half years after the last confinement. Aside from improvement in the condition of the uterus, conception depends on the state of the ovaries. If these remain normal, conception may occur, but if the ovaries are likewise atrophied, or perhaps affected because of an exudation around them, resulting from the puerperal state, then the sterility will probably be permanent. Thus very recently I had occasion to carefully examine, under chloroform, a woman forty years of age, for an affection of the external genitals, in whom, after two abortions some eight years previously, menstruation had entirely ceased and pregnancy had not again occurred. The uterus was considerably atrophied, about two inches long, retroverted and bound down posteriorly. The ovaries, although readily felt, were not larger than ordinary beans. In this case it seems to me that the ovaries were primarily atrophied, and that this prevented the only moderately atrophied uterus from regaining its normal size.

Of the *tumors of the uterine body,* (those of the cervix have already been noticed,) the fibromyomata are about the only ones we need consider. It is uniformly granted that they prevent conception. In the majority of women where these tumors exist, conception does not take place; in others fruitfulness is diminished to such an extent that more than one delivery is exceptional Numerous statistics bear this conclusion out.

I specially mention only those of Beigel, M. Sims, McClintock, Michel, Röhrig, Scanzoni, Schröder and Leopold Meyer. Their statistics differ as regards the frequency of sterility from 15 to 60 per cent. Winckel and Gusserow, who have collated a large number of cases (including the reports from some of the above authors), have reached about the same results. The first finds that almost 24 per cent., the latter about 27 per cent., are absolutely sterile, making about one-fourth of all women afflicted with fibromyoma unable to conceive. From the compilation of Winckel, it becomes evident what a large percentage of acquired cases of sterility are to be attributed to fibromyomas. He determined that women with fibromyoma average 2.7 children, whereas, according to his experience, healthy women average 4.5. Since these figures agree with those which we have arrived at concerning the fruitfulness of marriages in general, it is apparent what an unfavorable influence fibromyoma have on the process of reproduction.

The influence of these tumors is, of course, not the same in every case. This depends on various circumstances and complications. Their seat is a matter of some importance. Tumors which are polypoid or sub-mucous, protruding into the cavity, seldom permit conception to take place. The entrance of the spermatozoa is thus prevented, or the state of the uterine mucous membrane is such that the impregnated ovum can not further develop. Hemorrhages and discharges point to an unnatural condition of the mucous membrane. If the tumor is sub-peritoneal, then conception is more apt to take place, although here on account of the resulting dislocation of the tubes and ovaries, and on account of the inflammatory processes which may be excited in the peritoneal cavity, conception may be prevented in other ways. If the tumor is intramural, then it may, by compression of the cavity, the twisting of the tubes, etc., prevent the union between the semen and ovum.

The statistics of Leopold Meyer are of interest in this connection. In six cases the cervix was long the seat of the new growth, in two essentially so; in twenty-five other cases five were essentially sub-peritoneal, fourteen probably interstitial; in six the location of the tumor could not be exactly determined. There were five sub-mucous tumors, three fibrous polypi. According to these statistics the location has less effect on productiveness than it is the custom to think. The number of tumors also seems to have an influence, for many seated in the walls and surrounding the uterine cavity render conception very unlikely. The size of the tumor is also of importance. The larger the tumor the less likely is conception to occur, and although there are cases in which the reverse may be true, yet we cannot depend on the pregnancy going to full term, and then marriage remains childless, not because of sterility, but rather as a result of repeated miscarriages. The chances of conception, however, are not always dependent on the size of the tumor, for not infrequently at the very outset they seem to be detrimental to conception taking place. Thus I know of a number of women who, although married for two decades, yet have never conceived, and in whom only during the last ten years could I discover evidences of a fibromyoma, and that of a moderate size only. These are the cases which could be claimed as evidence that fibromyoma resulted from sterility, and not the reverse, a view which very often finds expression. Aside from the fact, however, that no reason can be given why the non-activity of the generative process should cause the growth of fibromyomata, it is also true that many unmarried old women are affected with similar tumors. The supposition seems much more natural to me that the first beginning of the new growth was present at the time of marriage, that it prevented conception, but gave rise to no other symptoms, and that only through the slow development, which is characteristic of these tumors, were symptoms produced which caused the patient to seek medical advice.

The malignant new growths of the uterus (carcinomata, sarcomata) prevent conception, since they either begin in the mucous membrane, or soon involve and disturb it. Owing to the rapidity of their course, the severity of the suffering, and the bad prognosis, the sterility does not call for treatment.

Diseases of the Vagina.—The physiological function of the vagina (the reception of the male organ, and of the semen which it ejaculates) may be disturbed in many ways. At the outset we must mention congenital malformations. The congenital lack of development of the vagina is in some cases so marked, that not even the lower part is patent for cohabitation, and in such a case the urethra is frequently widely dilated through attempts at coition. Not unusually this lack of development is attended with a corresponding anomaly of the internal organs of generation. So that *a priori* conception is impossible even after remedying the atresia. In other cases the malformation is confined to the vagina alone, at times there being partial occlusion, and again the canal is closed by a membrane, there resulting hematocolpos and hematometra. If this affection is rectified by making a canal, then conception can take place. This may occur in other ways, as where in a deep-seated atresia the vagina communicates with the rectum, and the semen enters in this way and reaches the upper part of the genital tract, and by the same route the child is delivered. Such cases are extremely rare. The best known case is that of Louis, which a hundred years ago deeply interested theologians, and called forth a bull from Pope Benedict XIV., allowing coitus to take place in this person's case by the rectum. Where atresia exists impregnation may also occur through the urethra, when the vaginal canal opens into the urinary canal, as was noted by C. Braun. A similar case has recently been reported by Th. Wyder.

In addition to this absence of the vagina, we may meet with marked congenital stenosis, the vagina, from the uterus to the external genitals, having a very narrow lumen; so that a speculum the size of the small finger can scarcely be inserted. Such cases of congenital uniform stenosis of the vagina do not appear to be very common. They are met with in obstetric practice, but descriptions are seldom given. I have seen only two such cases, and in both sterility existed.

Mrs. H., aged thirty years; external genitals small; vagina narrow, examination could only be made with the smallest sized speculum; married two years; sterile; introduction of the penis impossible. Dilatation of vagina was accomplished with sponge-tents and valvular specula, but conception did not occur; the husband had already passed his sixtieth year.

Mrs. Sch., aged twenty-seven years; married two years; stenosis more marked than in last case. Coition was not possible, although the husband was very capable. Same treatment; after complete dilatation of the vagina a pronounced anteflexion of the uterus was discovered; this was likewise treated. Conception occurred a few weeks later. The woman when in her thirty-sixth week of pregnancy perished with her husband when the steamer *Neptune* foundered on the Bieler lake, July 25th, 1880.

The majority of cases of congenital stenosis of the vagina exist in the form of a membrane which is transversely or circularly situated, and contains a number of smaller or larger openings. These septa, when deeply situated, may be obstructions to cohabitation. In this class belong cases of double vagina. If the uterus and its adnexa do not offer obstacles to conception, then this abnormality seldom interferes, although copulation may be rendered difficult. Only then can these septa determine sterility when one half of the vagina is wide in its lower portion, so that it can readily receive the penis, but ends above in a blind pouch, so that the emitted semen cannot reach the os externum. In a case of this kind, where the woman had normally given birth to a child, but then remained sterile, I was compelled to believe that the penis penetrated into the blind pouch, on which account I removed the septum, and the operation was soon followed by pregnancy. The remains of the embryonal septum, which occasionally is seen as a band running from behind and a little to the side and forward, hardly affect the act of generation. Even as the congenital, so may also the acquired atresia and stenosis produce *impotentia coeundi* and sterility. Into the method of production I can not here enter. In case of atresia, conception only becomes possible when it is overcome by an operation. Even afterwards, however, the new-formed canal is so narrow, on account of the amount of cicatricial tissue, that the prognosis is by no means so favorable, especially when the canal is rather long. In like manner may acquired stenosis and strictures prove obstacles to fertility. Here, also, the possibility and the probability of conception depends on the degree and extent of the narrowing. It often happens, further, that the process which has led to the atresia or stenosis—as for example, puerperal diseases—has caused changes in the internal genitals, which in themselves are capable of producing sterility. The malformations of the external genitals which are frequent accompaniments of acquired stenoses, such as laceration of the perineum, etc., are also to be taken into account

Tumors of the vagina may also cause sterility, and it is apparently immaterial whether these start from the walls of the vagina or from the vaginal portion. Cysts are specially to be considered. They may, from their size, fill up the vagina in such a manner that immissio penis becomes impossible, or at least they direct the glans penis entirely away from the os externum. If the tumors spring from the external os into the vagina, then we have in addition to consider the obstruction in the cervical canal, and further the hemorrhages and the accompanying catarrh are by no means favorable for the semen. In a similar manner do the various kinds of hernia and of prolapse of the vagina act, such as cystocele, rectocele, enterocele. In case sterility is present, then the accompanying pathological condition of the genitals rather than the affection itself is the cause, since the prolapsed portion may be replaced before coition, or offer little resistance to the act. Of course the emitted semen can be ejected by the spontaneous return of the prolapse. The frequency with which, in beginning prolapsus uteri, which is generally preceded by a sagging of the vaginal walls, conception still takes place, greatly reduces the importance of these affections as obstacles to conception. Still, definite statements concerning this cannot be formulated.

The abnormal communications of the vagina with the neighboring organs (vesico-vaginal fistulæ, vaginal fistulæ communicating with the urethra and rectum) can become very considerable obstacles to conception. The fact that with vesical fistulæ conception is exceedingly rare, is borne out by the statistics of Kroner. He found from his material that only in 10 per cent. did pregnancy ensue; consequently, sterility is not an infrequent result. The situation and size of the fistula seem to be entirely without influence in the production or prevention of impregnation. As regards the cause of sterility, it is essential to point out the fact that menstruation is frequently absent, often reappearing first some time after confinement, and then seldom recurring at regular intervals, and being accompanied by dysmenorrhœa. The connection is often evident. As the result of the delivery which caused the fistula, such changes occurred in the internal organs, that through these menstruation and conception are prevented, as, for instance, exudations around the ovaries, atrophy of the uterus, stenosis or complete occlusion of the cervix, etc. In other cases, however, and this I would emphasize, examination does not reveal any of these pathological processes, and yet menstruation ceases and pregnancy does not occur. So that it is necessary to claim the fistula as the cause, especially since after repair of the fistula menstruation returns. It seems, therefore, as though the fistula itself were capable of preventing menstruation and consequently ovulation. In those cases in which it must be admitted that ovulation continues, the urine must be considered as capable of preventing conception. Since it is an acid fluid, it robst he spermatozoa of their independent power of motion, or else directly kills them. Still there are cases where the semen had to pass through the receptacle of the urine in order to reach the uterus, and conception has taken place. I simply recall the cases of Simon, Fehling, Winckel, where conception took place, although on account of intractable fistula, transverse obliteration of the vagina had been attempted and had only partially succeeded. Perhaps these cases are explainable on the assumption that the urine in the pouch had become slightly alkaline and had thus lost its deleterious effects on the semen, Possibly the urine in cases of fistula acts more as a mechanical than a chemical obstruction, in that it washes the semen away. The bladder is compressed during coition by the male organ, so that the urine in it is forced out into the vagina, and when the penis is removed the escaping urine washes away the semen, and it is aided in this, since the vagina is often rigid and the introitus wide open.

In what way recto-vaginal fistulæ affect the reproductive process is not determinable. The cases are seen too infrequently by the single observer to enable him to draw any conclusion. Perhaps the fæces exert an influence. But since in case of fistulæ there exists a tædium coeundi, this fact will preferably explain the sterility.

In not a small number of women, who have already given birth to children, the absence of pregnancy is accounted for by the reflux of semen after coitus. It is proper in this connection to consider if there is in reality any truth in this almost universal opinion. As is well known, the older writers (Hippocrates and Soranus) sought the cause of sterility in this loss of semen. Even M. Sims, although he gives a different mechanical explanation, lays great stress on it.

There can be no doubt that the supposed reflux of semen is frequently based on a delusion, inasmuch as we have seen above that the secretion of the little follicles and especially the Bartholin glands during the act of copulation is excited, and that this moistens the external genitals, and is mistaken for regurgitated semen. Connection, indeed, can hardly occur without the male organ, on its withdrawal, smearing the external genitals with semen, while the bulk of it remains in the vagina. Still, on the other hand, it is not impossible that on rapid withdrawal of the penis the greater part of the rather tenacious semen may adhere to and follow it. Ordinarily, owing to the position of the woman, and the direction of the vagina upwards and downwards, the semen is retained. It is otherwise when the external genitals have been dilated by many deliveries, for then the introitus vaginæ is directed forward. If the perineum has been lacerated, however, then on this account, but more especially through the consecutive cicatrization of the vagina, the direction of the canal is more vertical, and the ostium vaginæ opens downwards. Then because of the insufficient closure and abnormal direction of the track, the reflux of semen is possible. The contraction of the pelvic muscles (levator ani) in this state of affairs will greatly favor reflux, for whereas in normal conditions it would send semen forward, it now assists in ejecting it towards the external genitals. In a woman of extremely lax external genitals, who had repeatedly given birth to children, and who always insisted on reflux of the semen, I cautioned her to catch the semen after coitus, and I found it to be in reality semen and in considerable quantity. In a woman under the same conditions, and with by no means a deep laceration of the perineum, I determined to pare the edges and to increase the length of the perineal body anteriorly. In her case conception soon followed. Although these two cases do not possess much weight, they still tend to support this supposed cause of sterility.

The influence of the vaginal mucus in causing sterility is but little understood. We know, as the result of a long series of experiments, that the spermatozoa of man and animals lose their power of motion, and indeed their vitality, when placed in contact with a variety of chemical substances. The acids act first as exciters and promoters of movements, and then as paralyzers. In cases of vesical fistulæ we have already noticed the detrimental action of the acid urine. On the other hand, it is known that the vaginal secretion is slightly acid, yet not sufficient to affect the semen. Still, under certain pathological conditions, the secretion may become so acid in reaction, that it acts as any other acid and induces sterility. It is an undenied fact that women who suffer from a severe vaginal catarrh not infrequently remain sterile. It is furthermore proven that under such circumstances, after cohabitation, spermatozoa are found rigid and dead.

A case of this kind which illustrates this cause of sterility has been reported by Lang. In a patient for fourteen years sterile, the semen was found to contain dead spermatozoa four hours after copulation, but directly after the act they were found still alive. After treating the vaginal catarrh, conception occurred within three months.

Although in many such cases other affections exist which are the consequences of the vaginal catarrh, and which might as well be considered causes of sterility, still a strongly acid vaginal mucus can of itself determine the condition. There are cases, however, where, notwithstanding profuse leucorrhœa, the reproductive functions are undisturbed. There must then exist conditions which can prevent the untoward effects of an acid vaginal secretion. Often these conditions are suspected, but can not be proven to exist, yet we meet in our experience with cases which explain these exceptions. Thus in the first place it may be important to consider the quantity of semen. If, as Mantegazza asserts, 45 minims of semen are ejaculated by a healthy man, then it will take a long time for the vaginal mucus to penetrate through this thick and tenacious mass. In all probability under favorable circumstances, where the semen is deposited in the neighborhood of the os externum, a sufficient number of spermatozoa may enter the cervical canal before they are affected by the vaginal mucus. Kölliker has pointed out the alkaline reaction of the semen, and affirmed that its chemical constitution is such as to neutralize the acidity of the vaginal mucous membrane. Perhaps the alkaline cervical mucus, which is also poured into the vagina and in genital catarrh is secreted quite abundantly, exerts a like influence, although on account of its tenacity it mixes but little with the vaginal secretion. If the amount of semen is small and deposited low down in the vagina, when a profuse leucorrhœa exists, then the chances of impregnation taking place are small, while under the opposite conditions a moderate secretion could not affect the semen Whether gonorrhœal secretion acts more injuriously than so-called laudable secretion, I can not express any opinion from the lack of experience. That the primary cause of the leucorrhœa should not be neglected in the etiology of sterility has already been emphasized. Lastly, it is proper to query if the vaginal secretion may not act in a mechanical way, in that a large production of mucus and pus may wash away the semen.

Malformations and Affections of the External Genitals.—For the completion of the act of generation it is essential that the male organ shall penetrate through the external organs of the female into the vagina. If the latter offers an insurmountable obstacle to the penis, then we speak of an *impotentia coeundi muliebris,* female incapacity to copulate. This condition is not always accompanied by sterility, as conception is possible, though it rarely takes place. Sterility and impotence are therefore not synonyms. The causes of obstruction which produce sterility can depend on a series of malformations of the vulva. The congenital narrowness of the vulva, which does not allow of an immissio penis, can be produced through various malformations of the external organs. In all forms of true hermaphroditism (in which the male and female are represented by the presence of testicles and ovaries) the external genitals, though small and misshapen, can yet resemble more those of the female. We are concerned here more, however, with the pseudo-hermaphrodite, in whom portions of the internal genitals may in a less or greater degree belong to both sexes, but where there is but one kind of sexual glands, and consequently only one sex, in which case the external genitals are more apt to resemble the female. Since the sex of the child is determined by the appearance of the external genitals, it may happen that the sex is mistaken, and therefore that two males are married. These cases, of importance medico-legally, do not interest us here. We are considering only those cases where the individual who enters into marriage, as wife, has abnormalities of the external genitals that prevent an immissio penis. These abnormalities consist essentially in the fact that the clitoris has developed to such a degree as to resemble a penis, while the labia majora have united posteriorly, so that the vagina is narrowed to a mere slit which does not admit the penis. Here the sterility does not depend alone upon an impotentia coeundi, but also on the condition of the internal genitals. If hermaphroditism exists, then conception is only possible when, not only the ovaries are present, but also the necessary canals for the conveyance of the semen and ovum, as vagina, tubes, and, in addition, a normal uterus for its further development. These malformations of the external genitals may exist while the internal are purely womanly, without any rudimentary trace of a male organ, and then we cannot speak properly of hermaphroditism, for the only prevention to conception taking place lies in the imperfect condition of the vulva. In this class belong those cases where the vulva is stenosed, through union of the labia majora, and there exists sterility because of the impotentia coeundi. This occlusion can extend so far forward as to leave but a small orifice for the vagina and urethra. This condition, which is called atresia vulvæ, often simply consists in an epithelial union of the labia majora, as Ziemssen has reported; again the union is a firmer one, and includes the labia minora. These congenital atresiæ resemble in their effects those of the acquired atresia and stenoses. As a result of diseases of childhood, all the parts forming the external genitals may become so united that the vulva is represented only by a membrane, which is perforated by a smaller or larger canal which leads to the vagina and urethra. I have recently seen an interesting case in which the canal was narrow, formed of dense bands of cicatricial tissue, accompanied by small rudimentary labia. Although an immissio penis could not take place conception yet followed. This latter result is the exception, sterility being the rule.

Abnormally small and imperfectly developed external genitals are also considered as causes of sterility. They may render an immissio penis impossible for a considerable time; still conception may ensue, as I have repeatedly noticed in cretins. The perfect development of the internal genital organs must be here granted. According to Roubaud and Tilt, absence or imperfect development of the clitoris may be the cause of sterility, since this is accompanied by frigidity of the female. I myself have seen but two cases of poorly developed clitoris with absence of organs, and in both cases delivery had occurred. Nevertheless, there are cases where abnormal development of the external genitals is combined with sterility, but here the formation of the vulva is only a sign of the imperfectly developed sexual organs generally, as is manifested by narrowness of the vagina, smallness of the uterus, absence of or scanty menstruation. These individuals are sometimes small and puny, sometimes strong and well-developed. Of the latter class I once had the opportunity of examining two sisters who consulted me because of their sterility. The vaginæ were in both widely dilated, as a result of sexual indulgence for many years, but the uteri were small; in both menstruation was regular but scanty, one had but little sexual appetite. I unfortunately failed to examine the breast. The acquired diseases of the external genitals in later life may induce sterility, in so far as swelling and rigidity of individual parts may render immissio penis an impossibility. Aside from the rare tumors which may develop at any point of the external genitals, cysts and herniæ may form in the labia majora, and elephantiasis, and especially excessive deposition of adipose tissue, may obstruct the way to the vagina.

Of the *abnormalities of the hymen* atresia scarcely calls for consideration, since the retention of the menstrual blood early leads to hematocolpos and hematometra, and an operation is required, which keeps the road open for the future reception of semen. It is still possible, however, that the opening, when sexual intercourse is to take place, may be found to be too small, especially if a simple puncture has been made. The obstacle then resembles those anomalies soon to be described. The deviations of the hymen from the normal are numerous, but the conditions which render cohabitation difficult are in reality only two, either the orifice is too small or the membrane too dense. These conditions prevent the dilatation or laceration of the hymeneal ring by the penis, particularly when both are combined, but that conception is even here possible is well known, for cases are recorded where the hymen was an obstacle to delivery. These cases, indeed, are so often referred to in text-books on Gynecology and Medical Jurisprudence, and have so frequently received attention in connection with sterility, that I need not specially refer to them.

We must state, however, that not every intact hymen forms an obstruction to copulation, since it often is pressed in and assumes a funnel-shape, or the apparently narrow opening is very dilatable, so that an immissio penis can take place without rupturing the membrane. Nevertheless this unruptured and unchanged membrane must be considered as rendering conception somewhat difficult. The obstruction may remain permanent, but not rarely the penis will form for itself a passage, or there may result a condition which will render copulation very difficult. This brings us to the most important of all obstacles to copulation which are connected with the external genitals, and this is *vaginismus*, which is the result of a nervous influence.

We may differentiate several forms of this affection, although they are always separable. Occasionally the external genitals of virgins are so hyperæsthetic that the first attempt at copulation produces such excessive pains that any further effort at coitus is rendered impossible. The hyperæsthesia is at times confined to individual parts. Thus Friedreich in his posthumous essay on "Hysteria of the Clitoris," considers this organ the seat, and claimed that special treatment should be directed to the clitoris in order to cure the sterility. Simpson described localized points of hyperæsthesia, situated not only at the urethra, but at other points, and probably dependent on the presence of little neuromata. In this connection should be mentioned the condition of the nerve ends in the labia minora, as described by my assistant Dr. H. Carrard, which are at the bottom of pruritus vulvæ, but in all probability they can give rise to hyperæsthesia as well. Occasionally the hyperæsthesia is a general one, and not confined to any one part, and then it may be considered an accompaniment of hysteria, and thus it is particularly seen in chlorotic individuals. The external organs are intact, but the very first sexual approach produces such pain that the women rebel against further attempts, even as they occasionally do from a digital examination. Unquestionably this is often the case at the first coition, but the wife being determined to comply, and the exalted sexual desire on the part of the ambitious husband combined, overcome the reluctance and pain. Yet at times this condition, especially when there is a state of apathy present, becomes permanent, and then comes under the observation of the physician. I have seen two pronounced cases of this kind. In both instances the external genitals were uninjured. One woman was represented as nervous, and possessed of peculiar ideas; the second was afflicted during her childhood with scrofula and was decidedly chlorotic.

In another class of cases this hyperæsthesia is wanting. In the beginning copulation takes place without pain or resistance, yet it does not accomplish its object, but simply results in producing irritation. Thence it follows secondarily that, on account of the pain, the act is only passively taken part in, and if the efforts are persisted in the local affection is simply increased, and painful spasm is finally induced. On inspection the external genitals are strongly congested, the nymphæ swollen, the hymeneal orifice inflamed, generally slightly torn. Secretion is only present after long suffering, and then only copious when there is gonorrhœal infection present. I have not as yet seen a case where there was undoubted specific infection.

The causes of this affection are manifold, and they may depend on either sex. Often it is a resistant hymen which, as we have seen above, prevents the introduction of the penis and thus the vulva is irritated. Very often awkward coitus seems to induce the affection. It is not always the case that it is a young, inexpert husband, but often such as have been accustomed to copulate easily, but are now obliged to dispense with the guiding hand of the chaste woman. It may also result from men who from impotence have not the power to overcome the resistance of the intact genitals. The woman may be at fault as well in that she does not assume a favorable position for the accomplishment of the act, and does not direct the male in the proper direction. In addition to smallness of the vulva and the resistance of the hymen, an unfavorable position of the external genitals may act as a cause, inasmuch as they are not under the pubic arch, but rather over the symphysis, so that the glans is directed against the latter instead of against the introitus vaginæ. On account of these conditions the external genitals are so irritated and inflamed that any further attempts at copulation are prevented. Occasionally the brutality of the husband will accomplish the act, but in other cases contractions of the neighboring muscles are induced, thus giving rise to the third form, which has received the special name of vaginismus. At every attempt to copulate, indeed even before the glans has approached the irritated genitals, further even at the very thought of coitus, contraction of the constrictor cunni, which in reality acts as a supporting organ to the penis, takes place, and this prevents further entrance of the male organ into the vagina. Probably the levator ani takes part in this spasm. Here also by attempts at further indulgences increased suffering is inflicted. There is no doubt that where simple hyperæsthesia of the external genitals occurs without any inflammatory irritation, contraction can be induced, and then as the result of the attempts to overcome the obstruction, inflammatory manifestations take place. As is evident these separate forms can merge into each other.

Other affections situated in the neighboring parts can, by inducing the above contractions, prevent cohabitation—as, for instance, urethral caruncle, especially since it comes in direct contact with the penis. As for fissure, it is a problematical cause. In case of coccygodynia, I have not noticed that coition is disturbed.

The last-named affections do not always cause disturbances in the early years of married life, but, on the contrary, usually first appear after delivery. Inflammatory processes—as, for example, those of the introitus vaginæ with pronounced congestion, and sensitiveness of the carunculæ myrtiformes—may, after a number of confinements, prevent cohabitation, but medical aid is seldom sought because of non-conception.

It happens very rarely that the introitus vaginæ is displaced because of narrowness of the pelvis, the columns of the pubic arch being so close together as to make an immissio penis an impossibility. It is seldom that the physician is consulted because of sterility in instances of this kind, since marriage is not entered into with such a deformity. Such cases do occur, however, frequently in patients suffering from osteomalacia. It has happened only once to me that, after recovery from this disease, complaint was made of the inability to cohabit. In forensic medicine, the question whether a woman thus deformed should be allowed to copulate might be of practical importance.

CHAPTER XVII.

STERILITY OF THE MALE.

THE causes of sterility dependent on the male may, even as in the woman, be due to a number of pathological processes and conditions. These causes in the male can be divided, much better than in the female, into two main groups, which as a rule are distinctly separate from each other, and are much more rarely seen in combination.

This division into two groups, it is true, does not rest upon a pathological basis, which at the present time is rightly made the chief criterion in classifying diseases and functional disturbances, and which we have also followed in speaking of the causes of sterility in the female, but yet it offers so many practical advantages, especially in regard to diagnosis, that it seems justifiable in this case to depart from the rule.

In the first place, there may be no ejaculation of semen whatever, or the seminal fluid, though properly introduced into the female genitals, is unfit for propagation; or secondly, cohabitation is impossible, or takes place in such an imperfect manner that the seminal fluid cannot be deposited in the vagina. The former condition is called "Impotentia generandi," or male sterility proper, whereas imperfect coition is called "Impotentia coeundi," or simply "Impotence." The first form must here be particularly emphasized and more thoroughly discussed, because the more exact knowledge of it belongs to recent times, and because it occurs, as the latest researches have shown, with a frequency of which, until now, we had no idea. Its interest is the greater because, as has been said, it occurs during a cohabitation that is regular in other respects, a circumstance which so far has not allowed the acceptation to gain ground that the cause of the sterility resides in the husband. Very often in such cases suspicion is entirely directed to the wife, and gives rise to a very faulty therapy; it is, therefore, of very great importance to gynecologists. The existence of this form, moreover, shows that the sterility of the two sexes is not separable, as regards diagnosis, by so hard and fast a line as has been customary.

This form of sterility of the male, where cohabitation is performed in the regular manner but without success, may be due to different causes.

It may happen during coitus that, though the orgasm has taken place, and the feeling of voluptuousness has been fully satisfied, yet no ejaculation of semen into the female genitals occurs. This condition is called aspermatism (aspermia, aspermatia, aspermasia, absence of semen). It may sometimes be a temporary condition, confined to certain periods during which the male is deprived of generative power (temporary or relative aspermatism), or it may cause permanent sterility in marriage, beginning either in youth or at a later period (permanent or absolute aspermatism). These two kinds differ both etiologically and anatomically. Temporary aspermatism depends mainly upon a nervous disorder; the sperma is there, though perhaps not in large quantity, but the impulses from the central nervous system are wanting or the nerves presiding over ejaculation fail to perform their office—there is no discharge of semen. Even though material disorders in the genitals themselves be present, they do not prevent ejaculation directly, but only through the action of the nervous tracts. The causes of these nervous disturbances are manifold in their nature. They have this in common, that they may disappear again after a longer or shorter time, or under certain external conditions; when they are removed, their influence upon the genital organs also disappears, and their functions may then resume a normal character. These causes that work temporarily are about the same as those which may lead to the so-called psychical impotence, and they will be mentioned with that affection.

A much more serious trouble is the permanent, absolute aspermatism. It depends, contrary to the preceding, upon material, and, as a rule, lasting changes in the genitals; here, too, seminal fluid is produced and there is an erection, but an obstruction in the course of the male ducts does not allow the semen to enter the vagina. It will be seen that it is only the absence of semen in the female genitals after completed coition that is comprised, according to the present doctrine of sterility, in the term aspermatism; the cases where, in consequence of mal-development and of acquired changes in the testicles, there is no production of semen at all, are not here considered, especially since with the anomalies there is as a rule no erection, so that the consequence is usually not really sterility but impotence. (See the remarks on azoospermia further on.)

The obstruction to the ejaculation of semen again may vary in its seat and its nature. A strongly pronounced phimosis may lead to retention of semen. Very narrow strictures of the urethra likewise are capable, throughout their entire course, of preventing the ejaculation of semen. In these cases the semen is poured into the urethra, but it remains there in consequence of the obstruction. The fact that urine can still be voided through the stenosed parts that obstruct the semen, can be explained by the great force that is employed in passing urine by the contraction of the bladder and by abdominal pressure, exceeding by far the force with which semen is ejaculated. It is also possible that the erection of the penis increases the stenosis, so that the spermatic fluid, with less *vis a tergo,* would have to overcome a much greater obstacle than the urine has to overcome when the penis is relaxed. Thus it may happen that the seminal fluid does not flow from the urethra during cohabitation, but only after removal and relaxation of the penis. If the stricture is situated rather far back in the *pars pendula penis,* the sperma, after collecting in the urethra, may even be discharged into the bladder, so that the spermatic fluid becomes mingled with the urine, and is not voided until the next micturition, when it can be microscopically demonstrated in the urine.

A much more frequent cause of permanent aspermatism is found in the diseases of the prostate gland. All the affections of the prostate have this in common, that they cause a high degree of stenosis or atresia of the two ejaculatory ducts, and thereby may prevent the entrance of the sperma into the urethra. The various tumors of the prostate do not so much come into consideration here, for these only make their appearance in advanced age, running a rather rapid course. Moreover, the matter of sterility scarcely is considered at all on account of the presence of other troubles. The same facts are true of hypertrophy of the prostate. But on the other hand cases of congenital hyperplasia of the organ have been recognized as causes of sterility of the male. The most frequent causes probably are the inflammations of the prostate and of its ducts. These may, either directly or by an abscess formation, bring about an atrophy of the prostate gland with consequent occlusion or stenosis of the ejaculatory ducts. Calcifications within the substance of the organ, as a rule, also a consequence of inflammation, may bring about a similar result. Furthermore traumatism, operative interferences (lithotomy) etc., may cause changes in the tissue of the prostate, and in this way the terminations of the seminal ducts may become impassable. Then there are the inflammations of the seminal ducts themselves, which still more frequently than prostatitis are of gonorrhœal origin. If the two ejaculatory ducts are especially affected in this way, there may be produced stenoses or occlusions with retention of seminal fluid as a consequence. Inflammations of the seminal vesicles alone are not sufficient to cause aspermatism. For this reason Roubaud is not justified in considering a failure of proper conservation of the sperma in these structures, to be a particular kind of sterility. But inasmuch as with an inflammatory affection of them, the ejaculatory duct is as a rule also involved, there may be a lack of seminal fluid when they are diseased.

If the obstruction has its seat further back toward the testicles, *viz.,* over the confluence of the seminal vesicles, there may result an ejaculation of fluid during cohabitation. It may even be rather copious, but it is only the secretion of the accessory glands (seminal vesicles and prostate), which is entirely devoid of the active principle of the semen, namely the spermatozoa. This condition forms the transition, or perhaps belongs properly to the following anomaly, the so-called azoospermia.

This name implies that functional disturbance of the male genitals, with which sexual excitement, erection, and cohabitation regularly takes place, and even, contrary to aspermatism, a semen-like fluid is ejaculated into the vagina, but this fluid lacks the most important thing, the spermatozoa. The secretion that is discharged is much more fluid than normal semen; but it retains the characteristic odor and also the peculiar crystals, for these two properties depend not upon the secretion of the testicles, but upon that of the prostate. A microscopical examination will show masses of detritus and those well-known sperma crystals, but no trace of spermatozoa.

This anomaly in the majority of cases is of a permanent character, and seems much more rarely to exist as a temporary suffering. This permanent, absolute azoospermia may be produced by mechanical obstructions which render the discharge of spermatozoa into the urethra impossible, though these may have been properly formed in the testicles, but which do not prevent the evacuation of the secretion of the seminal vesicles and prostate. This will occur when the occlusion of the seminal canal is beyond the prostate, between it and the testicles. It is furthermore necessary that this defect should exist on both sides. Now this obstruction may consist in an imperfect development or a complete absence of the seminal duct and epididymis, a failure in development which, however, is very rarely observed. A very frequent condition, on the other hand, is an acquired stenosis of high degree or a complete atresia of the seminal ducts; both of these conditions again may frequently be the result of gonorrhœal infection. A still more frequent cause of the interruption of the seminal canal is a bi-lateral epididymitis, produced by extension of a gonorrhœa, followed by a shrinking of the epididymis. In like manner an inflammation of the spermatic cord of similar origin may render the seminal ducts impassable.

Various processes taking place in the testicles, which finally lead to an atrophy of these organs, such as certain general diseases, severe injuries of the brain and spinal cord, troubles of the central nervous system affecting the centres presiding over the function of the testicles, chronic iodine poisoning, may lead to azoospermia as well as to aspermatism, but before they do this, impotence has generally occurred. The cases, therefore, in which these two disturbances concur are, by reason of chronological priority, better classified with impotence.

It may well be doubted that the lack of spermatozoa in the case of men otherwise potent should depend simply upon an occlusion of the seminal organs. The anatomical researches of Gosslin, the experiments on animals by A. Cooper, Curling, and lately by Kehrer, show especially that the occlusion of the vas deferens causes a collection of the sperma, and thereby a dilatation of the seminal canal and of its branches far back into the testicle, leading finally, just like occlusion of the ducts of other glands, to atrophy of the testicle. Ligations of the spermatic cord also bring about degeneration of the testicle, though in a somewhat different manner. That Brissaud's assertion of the opposite is untenable is shown by the way in which castration of certain domestic animals is performed, for all these methods lead to an atrophy of the testicle by a compression or cutting of the spermatic cord. Though the atrophy proceeds slowly, yet it seems finally to result without exception. But with such a change in the testicles, a continuance of regular cohabitation cannot take place; it would, therefore, be impossible that men who suffer from azoospermia could continue to have coition for years, and even tens of years; for the atrophy of the testicle dependent upon the occlusion of the seminal ducts would have produced impotence in a much shorter time.

These theories are again supported by further examinations of the semen. Thus A. Schlemmer found, among a large number of apparently healthy individuals, six in whose semen not a trace of spermatozoa was discoverable; some, indeed, had recovered from genital affections, but their virile power was not diminished. Still more striking were the results of the observations of F. Kehrer: In 40 cases of sterility in marriage, in which there was no pathological condition on the female side, he found absolute want of spermatozoa in the semen of 14 potent men. Only 8 acknowledged a former gonorrhœa. A still more positive proof is furnished by the further researches of A. Schlemmer made upon the secretion of the testicles of men who had died suddenly. He found among them 8 men below sixty-eight years of age in whom no spermatozoa could be demonstrated.

While the examinations of the sperma of the living show us that azoospermia can exist with potent men, the examinations of the cadaver show in addition that the seminal canals may be passable. Azoospermia, therefore, is not always to be accounted for by a defect in the expulsion of semen, but in a failure of its production. The causes of these functional disturbances of the testicles are further shown by researches of A. Schlemmer and A. Busch. Above all, the chronic wasting diseases are to be mentioned. In the testicles of a number of patients who had died of various diseases, Busch found spermatozoa in 13, very few in 13 other cases, and none at all in 11. In 45 cases of pulmonary phthisis 8 had many, 20 but few, and 14 no spermatozoa. Of other diseases diabetes and alcoholism are to be mentioned. Some drugs are also said to work to disadvantage. Some of the chronic diseases, however, would rather diminish, and would lead to sterility in this way rather than through azoospermia. Severe acute diseases also exert a very unfavorable influence upon the production of spermatozoa. In 13 cadavers of individuals who died from acute diseases, Busch found in 9 many spermatozoa, in 3 but few, and in 2 none at all. Still more frequently, probably, various local diseases of the testicle and its surroundings lead to azoospermia. Of these gonorrhœa plays the principal *rôle.* This disease may in its course attack all the seminal paths, but most frequently invades the epididymis. Next there are inflammations of the testicle itself and of its sheath, which again may be of gonorrhœal origin, but may also occur as a consequence of constitutional syphilis. These venereal affections, however, are not the only ones that cause insufficient function of the testicle, but traumatic inflammations, hemorrhages into the tunica vaginalis, hydrocele, pronounced varicocele, large scrotal herniæ, may by strong and continuous pressure bring about the same result. Tuberculosis also and tumors, when they attack both testicles, may lead to azoospermia. With these affections it may occur as a temporary trouble and may disappear as recovery takes place, but a prolonged duration of the disease will bring about further changes in the tissue and permanent sterility. We must also remember the premature senile atrophy of the testicle, an occurrence which does not take place so regularly nor at so certain a period of time as with the female sex. With some individuals the testicle may functionate till old age. The anatomical changes which as a rule are the fundamental cause of azoospermia, are degenerative processes which occur in two forms: fatty degeneration of the contents of the seminal canals or induration, cirrhosis, of the connective-tissue.

Some of the cases observed by Kehrer make it seem probable that sexual excesses, masturbation, etc., can bring about this condition even without the assistance of the inflammations mentioned above. Of course if the remains of an inflammation that has run its course are not discoverable, and if the diagnosis is based entirely upon the history given by the patient, it is difficult to be positive on this point.

Deficient development of the testicle or its retention in the abdominal cavity may also bring about azoospermia instead of impotence, as Busch has observed. Some other cases again lead to the question whether azoospermia could also occur without disease or failure in development. Certain cases of apparently entirely healthy men are reported where neither the history nor the most thorough examination could prove the existence of any defect or remnant of disease that would explain the existing azoospermia. Although mistrust in regard to the patients' statements is justified in all these cases, yet the possibility of such a condition cannot be excluded. If such cases, as for instance Hirtz has described as idiopathic sterility, can be confirmed by further reliable observations, there could then be no doubt that with perfectly healthy individuals, uninterrupted sexual desire, and regular performance of cohabitation, there may be no production of spermatozoa whatever. If the genitals, especially the testicles, prove normal, it is then indeed justifiable to think of an abnormality of the centre of function of the testicle. We would then have a congenital absolute azoospermia. But this would contradict our usual views in two respects. It could not then be true that the formation of semen in the testicle is what causes the awakening of sexual desire, and secondly the centre of erection could not be identical with that of the production of semen, as is believed, but would have to be separate from it. Physiology gives no satisfactory explanation of this point.

It is also of great interest that azoospermia has been observed to occur in animals. H. Fabricius tells of a stallion that mounted thirty-four mares in the space of two years in the most proper manner, without being able to impregnate them. In its copious semen not a single spermatozoon was to be found. This observation is particularly valuable in regard to etiology. It shows that the belief, held by many, that azoospermia is brought about only by venereal processes is not quite justified. Here some other cause must have been active.

Azoospermia also, though much more rarely than aspermia, may appear temporarily, so that spermatozoa are only occasionally wanting. It must be regarded as a sort of physiological azoospermia, if after rapidly repeated connections the semen is not only reduced in quantity, but instead of fully developed elements only younger and smaller spermatozoa appear, which gradually diminish in number, and finally disappear altogether. Plönnies has shown this to be true by experiments on animals, Casper and especially Schlemmer by numerous observations both on men and animals. But with otherwise healthy individuals this condition lasts but a short time; after a period of rest and abstinence the spermatozoa which, because of their rapid elimination, consisted of newly-formed elements, the dimensions of which were small, again return to their former size and number. In a more pathological manner the spermatozoa may temporarily be wanting during excessive, long-continued, bodily exertion (perhaps also intense mental work?), wasting diseases and conditions of weakness that arise from severe, acute sufferings; the above-mentioned researches of Busch point to such an unfavorable effect of acute diseases. With local diseases of the genitals, also, there may be absence of spermatozoa in the semen—with convalescence the spermatozoa again return; but if, in consequence of acute diseases, there are further changes in the genitals, the azoospermia may also become permanent and absolute. Psychical influences, however, seem to have no effect upon the production of spermatozoa.

Besides aspermatism and azoospermia, it seems that other causes of sterility exist that arise from defects in the semen. It must be mentioned here that in some cases of sterility brought about by certain local diseases, the spermatozoa are not entirely wanting, but are present in very small number, a condition which has been called oligozoospermia. It often is a transition to azoospermia, but perhaps it may also occur during recovery from that affection.

Recent researches have, however, made known to us still other conditions of the sperma, which may possibly also enter into the etiology of sterility. For it is a remarkable fact that not infrequently the spermatozoa are found motionless in the vagina very soon after cohabitation. It may of course be supposed in such cases that an abnormal secretion of the female genitals may exert a deleterious influence upon the spermatozoa, but often the condition of the female genitals is not at all unfavorable to the spermatozoa, so that we might suppose that they were already dead when ejaculated into the vagina. It is possible, however, that the normally formed spermatozoa may be caused to die by passing through diseased seminal paths, and through their diseased secretion. On the other hand, the spermatozoa taken from the female genitals occasionally have not the proper shape and dimensions. Sometimes their shape is perfect, but they are too short and too narrow, such as are found after rapidly repeated connections, or in individuals that have scarcely passed the age of boyhood and in old men. It seems that sterility among too young and too old individuals depends not alone upon the quantity, but also upon the quality of the spermatozoa. If these young and small spermatozoa are also met with in manhood, it seems questionable whether they would be as well fitted for propagation as the older and larger ones. Spermatozoa have also been found that were peculiarly misshapen. Of course from seminal emissions the changes of shape were not so marked as Menzel has found and pictured in spermatocele. The decomposition of the spermatozoa into their constituents also, *i.e.*, the separation of the head from the middle part, often takes place very early. Although here again the influence of the vaginal secretion and the mechanical insults during microscopical examination might easily be the cause of these changes of shape, yet on the other hand it cannot be proved that the spermatozoa did not leave the urethra in this condition—in fact, researches by Hausmann seem to prove that these deformities may exist in the urethra. The suspicion would then arise that these changes were produced by the male not the female genitals. It would not be very far-fetched to imagine that, in some inexplicable cases, sterility is due to such abnormalities of the elements of reproduction, not alone of the sperma, but also of the ovule. Certainly the researches in this direction will be more numerous in the future, and will give us the necessary information; at present it is merely a matter of conjecture.

As for the frequency of male sterility, it is, according to the latest researches, greater than was ever imagined. Azoospermia, the most important item, according to Kehrer's statistics, is very frequent (fourteen in forty cases). The researches of Schlemmer and Busch give similar results: the latter found among 100 cadavers 34 with many, 39 with few, and 27 without any spermatozoa. These figures, having been derived from the cadavers of patients, of course cannot furnish a general standard. With sufferers from chronic diseases the question of sterility scarcely ever arises. The relative frequency of azoospermia in acute diseases, however, is of great importance, as it is questionable whether this will disappear in case of recovery allowing the testicle to resume its normal function, or whether it will remain as an incurable defect. Azoospermia after gonorrhœal affections deserves an almost equal amount of attention. If we get further confirmation of the great frequency of sterility after these affections, which in various other ways can impair the power of reproduction, it will be necessary, in view of their frequency and of the rather careless therapy too often seen, that they be viewed and treated from the start as diseases having serious consequences.

CHAPTER XVIII.

IMPOTENCE OF THE MALE.

STERILITY of the male in its more restricted sense, as described in the preceding chapter, where cohabitation is regularly performed, but where no impregnation takes place, either on account of complete absence of the seminal fluid or of deficiency in its quality, is a very different thing from the so-called impotence of the male. By this term is meant that defect in the male which renders him incapable of introducing the penis into the female genitals for the purpose of ejaculating semen. This generally implies that it is impossible to bring the penis into an erect condition or to keep it so until coition is completed, and, therefore, this condition, especially in the more vulgar acceptation, is termed impotence in the more restricted sense. In impotence the spermatic fluid may behave regularly, it may even, though in very rare exceptions, come in contact with the female genitals, and bring about an impregnation, but in the vast majority of cases this does not happen, but impotence has sterility as a consequence. On the other hand there may even be erections with ejaculation of semen, but certain local causes residing in the male individual himself may prevent the introduction of the penis, and thereby render conception impossible. These cases must also be classed with impotence. But as a rule, a want of erection coexists with impotence.

However sharply these two categories, sterility proper and impotence, are distinguishable from one another in the majority of cases, yet they have many things in common. Especially in regard to etiology is there a certain connection between them, inasmuch as the same cause is liable to bring about sometimes the one disturbance, sometimes the other; again in the same individual the two conditions may alternate with one another, as also the same therapeutic measures may not infrequently be used with success in both abnormalities.

This impotence of connection, which, as has already been observed, with very rare exceptions, has sterility as its consequence, can be most naturally traced back to two classes of causes. Either it is founded upon alterations of the genital organs, more or less easily seen, or other severe troubles, especially disturbances of nutrition, or else the genitals are normal and the general constitution is not broken down, but yet erections do not occur because of insufficient innervation. The first form has been termed organic, the latter inorganic or psychical impotence.

As regards organic impotence, the congenital defects of the testicle must be mentioned first. Very rarely both testicles are absent (anorchism); there is then of course neither sexual desire nor erection. More frequently a testicle is present only on one side; the degree of impotence then depends upon its greater or less development. Still more frequently an insufficient development (hypoplasia) of the testicle is observed; it is too small, and a microscopical examination either shows no trace or but slight indications of seminal canals; and even if the latter are less imperfectly developed, yet there is no production of spermatozoa. If the testicles are not contained in the scrotum, this fact of course does not prove an absence of these organs, for they may have been retained in the abdominal cavity (cryptorchism). They may indeed be well developed, but not infrequently they are of small size, especially if they have remained in the inguinal canal. With this anomaly, therefore, impotence is not of rare occurrence, even when one testicle has descended into the scrotum; for it seems that a testicle like the one that remained in the abdominal cavity is either of defective construction or degenerates later.

The loss of both testicles in adults also produces sterility and impotence. They may perish either by absolute removal (accidents, etc.) or by acute and chronic inflammations, whether these are the result of a trauma, a gonorrhœal infection, or some other local trouble confined to the genital and urinary organs, or some general disease. Complete disappearance, however, as a consequence of disease, takes place very rarely; much more frequently there is a shrivelling of the connective tissue brought about directly or by suppuration, an atrophy with loss of secreting tissue; but this is of the same significance in regard to the sexual functions as complete destruction. It deserves attention that, when the testicles of adults are destroyed, the sexual desire and the faculty of coition are not by any means immediately abolished—a similar observation as with women after removal of their ovaries, where sexual tendencies also remain for some time. But sterility certainly follows upon loss or atrophy of these parts in either sex. It must also be observed that not every inflammation, not even the most intense, necessarily leads to an atrophy of the testicles; thus in syphilis, in gonorrhœa, the form and size, and probably also the structure of the testicles not infrequently remain as before, but as a consequence aspermatism and azoospermia occur. The various new growths also, that affect the testicles, may abolish the power of reproduction by a destruction of the glandular tissue.

Whether a congenital permanent impotence, such as is seen in idiots, cretins, etc., can also occur with people whose bodies and genitals are otherwise well formed, is not yet quite certain, in spite of some accurately described cases. It is still possible that the testicles in such cases, though their form be otherwise intact, may be abnormal as to the structure of their parenchyma. Of the diseases of the epididymis and of the spermatic cord, scarcely any except the acute and chronic inflammations, which may arise from the same causes as orchitis, need to be considered; these, when the testicle is intact, are less liable to produce impotence than sterility directly, by an absence of the seed elements proper, as has been described.

Of great importance are the diseases of the organs at the junction of the urinary and genital paths, *viz.*, of the prostate, seminal vesicles, and ejaculatory ducts. Chronic inflammations of these parts, some having been produced gradually, others arising from acute processes, are not infrequently found among the impotent. Sometimes the site of the disease is confined to the pars prostatica urethræ with the colliculus seminalis, that includes the mouths of the ejaculatory ducts. These affections, however, are not merely the consequences of a gonorrhœal urethritis, but are much more frequently produced by great over-excitation of the genitals (onanism, sexual excesses). This ailment, however, is not as a rule followed by impotence directly, but in the first place by involuntary seminal emissions in the form of *pollutiones nocturnæ et diurnæ*, which may be later followed by a true spermatorrhœa. The impotence in this case may indeed be explained by an irritation starting from the diseased part, and exerted upon the centre of sexual function, the spermatorrhœa, however, by the flaccidity of the ejaculatory ducts that ensues, so that the sperma produced, or the secretion of the accessory glands, can empty itself spontaneously into the urethra. With these losses of semen there is almost always combined an inability of erection and consequently sterility, the fluid that is poured out, at the same time, in the severe cases, containing few or no spermatozoa, so that azoospermia is combined with this affection. The impotence, however, is not to be ascribed to a weakening of the organism in consequence of the loss of semen, but is to be regarded as the expression of an affection of the centres of sexual activity. The centripetal irritation is no longer responded to by the act of erection. But inasmuch as spermatorrhœa and impotence may often occur in consequence of sexual excesses, while an examination fails to show any such inflammatory affection of the prostatic portion of the urethra, and inasmuch as this latter mode of origin of male sterility occurs much more frequently, the local affection upon which so much stress was formerly laid (Lallemand and his school) has lost much of its significance as a cause of sterility; in fact, according to the views of some, it is to be regarded merely as an assisting or even merely as a coexisting factor in the etiology of spermatorrhœa and impotence. (Curschmann.)

Whereas the affections of the genitals, thus far considered, manifest themselves mainly by a want of erections, we now come to a number of defects that may prevent regular coitus in spite of engorgement of the corpora cavernosa. These are the various abnormalities of the penis itself. Traumata that affect the penis may bring about a tear in the corpora cavernosa, with consequent hemorrhages. The indurations that are formed during the healing process may cause such deformities of the penis that, when it is in the erect condition, it loses the shape and direction necessary for introduction into the vagina. In the case of inflammations also, if in the same situation, the callosities which arise may bring about the same result. But even an inflammation of the connective-tissue coat of the corpora cavernosa, if it has reached a certain development, suffices to affect the form and position of the erect penis in a manner unfavorable for cohabitation. Here also must be mentioned those shortenings of the frænum which are either congenital or more frequently acquired by ulceration; cicatrization also influences the capability of the penis becoming erect, and the meatus urinarius is drawn in a direction unfavorable for the ejaculation of semen. All pathological formations that greatly increase the volume of the part may also prevent coitus, and lead to impotence. Among these may be included those cases where the circumference of the erect penis is so considerable that it cannot be introduced on account of the great disproportion. These cases cannot be denied. The inability of introducing the largely developed penis into the vagina certainly occurs often enough, especially when the female genitals themselves are insufficiently developed and very resisting; but by force, and with increased practice and experience, the obstacle can certainly be overcome in time. Of the tumors of the penis, but few come into consideration; in the case of the malignant ones their character excludes the question of sterility, and the benign tumors do not often increase the volume of the penis considerably. Diseases of the neighboring parts may also interfere with coition. Large œdemas of the scrotum, considerable hydroceles, may encircle the penis or lie close to it in such a manner that an introduction into the vagina becomes impossible. Then there is also the condition in which the penis is connected with the scrotum, a duplicature of skin joins the under surface of the penis to the scrotum, and prevents the regular erections. In a similar manner large irreducible scrotal herniæ or elephantiasis of the scrotum may make sexual congress impossible. Another group of abnormalities of the penis comprises those cases in which erection takes place in the regular manner, the penis is properly introduced into the vagina, and sperma is ejaculated, but the latter, on account of certain deformities of the penis, is discharged outside of the ostium vaginæ. These include those congenital or acquired lip-shaped urethral fistulæ. If these are fairly large, and are situated pretty far back toward the scrotum, the sperma is not discharged through the anterior portion of the urethra into the vagina, but outside of it through the fistula. The same thing takes place in the case of epi- and hypospadias, if the opening is near the root of the penis. In all these cases erection and cohabitation may be normal, but the semen is discharged outside of the vagina. It is similarly the case in pseudo-hermaphroditismus masculinus externus. Here the penis is rudimentary and resembles a clitoris. By sexual irritation it may undergo an erection, it may even, if somewhat more developed, enter the female genitals, and coitus may be, though imperfectly, performed. But as in all these cases the urethra empties at the root of the penis, there can also, as in hypospadias, be no discharge of semen into the vagina.

Another group comprises those cases in which, on account of absence or imperfect development of the penis, there cannot be any efficient sexual congress with the female at all. Complete absence of the penis, with a body normal in other respects, occurs very rarely as a congenital affection; more frequently there occurs a rudimentary formation, the penis being replaced by a body resembling a button, which, even under sexual excitation, takes on such slight dimensions that cohabitation is not possible. When absence of the penis is acquired by amputation, mutilation, gangrene, etc., much depends upon the size of the stump that remains. When the rudiment is still considerable and the opening is normal, there is still a possibility of the stump entering the female genitals. It must be emphasized that a glans penis is not at all necessary for this purpose, as is proved by many a case of congenital or acquired defect of that part of the penis.

It is known that a considerable number of diseases can diminish or abolish a man's potency. The genitals at the same time are normal, at least in the beginning, and have heretofore performed their functions in a regular manner. These diseases are mostly of a chronic nature, and are combined with more or less prostration. With most of these disturbances of course potency or impotence does not come into consideration, but it does in a number of others where great weakness in the sexual relations or even entire impotence occurs early, sometimes even before the other symptoms of the disease are pronounced. Here the general weakness produced by the disease cannot be considered the cause of the impotence, but the disease itself directly exerts an unfavorable influence upon the centre of generation. In the first instance certain diseases of the central nervous system are to be mentioned. With spinal meningitis as well as with chronic myelitis the sexual activity is as a rule depressed, but this is not constant, and often does not occur until a later stage. Much more constantly impotence occurs with tabes dorsalis, often very early, but in the beginning sometimes alternating with periods of sexual excitement, which soon, however, disappears entirely. Sometimes sexual power remains very long. Thus a woman in my practice, whom I delivered artificially, because of placenta prævia, had to be persuaded by the clergy to desist from a suit of divorce from her husband. The complaint was founded upon satyriastical tendencies of the husband, who had long exhibited exquisite symptoms of tabes. These cases, however, are rare exceptions. The explanation of this impotence is very easy; either the lower part of the spinal cord in which the centre of the function of generation must be sought is itself affected, or else the upper part of the central nervous system being diseased, exerts the inhibitory influence already mentioned. Impotence is also observed with certain diseases of the digestive tract—perhaps the influence here exerted is rather of a psychical nature, being brought about by consecutive hypochondriacal conditions. Diseases of the kidneys, especially chronic Bright's disease, have similar consequences. The best known is the influence of diabetes mellitus upon the sexual organs. Almost always impotence is at first the only symptom. Very rarely sexual desire is preserved for a long time, sometimes it is even slightly increased. The physiological explanation of this influence is not easy. A large number of articles of diet and drugs are said to have an influence upon sexual activity. Of course we now refer to a prolonged use of them, a chronic intoxication. Thus the abuse of alcohol, chronic lead poisoning, prolonged stay in the vapors of antimony and arsenic, prolonged use of preparations of iodine, are said, according to the views of many toxicologists and the experiences of many prominent physicians, to diminish the potency of the male, but this does not occur with all individuals without exception. In the case of other impotent men other causes are often to be found, so that these substances act rather as auxiliaries. Besides these a similar efficacy is ascribed to camphor, bromide of potassium, and lupulin, whether justly so is not yet certain; at present they have the reputation of acting as soothing agents in sexual irritation. Perhaps this is the explanation of their reputation as agents in producing impotence. The same effect is ascribed to the various narcotics; at present this has only been proved of morphine, for according to the latest experiences, sexual activity seems to be greatly depressed or entirely abolished by the opium habit. (Levinstein.) All these agents seem to exert their unfavorable influence directly upon the centre of generation, but a direct influence upon the organs of generation must also be admitted; thus in alcoholic subjects there may occur a degeneration of the testicles, which alone can produce impotence.

Following this group of causes of sterility that depend upon organic defects of the sexual organs, or other diseases and disturbances of the organism, there is a category of cases that are perhaps still more important in practice, *viz.*, those who have become impotent through sexual excesses.

In the highest development of this condition, a complete paralysis of sexual activity exists. Even the strongest irritations exerted upon the centre of sexual activity are not capable of bringing about an erection of the penis. Along with this disturbance in the nerve tract, which proceeds from the centre to the genitals, there is also an alteration of the centre itself, which no longer reacts to irritation conveyed by the organs of sense or by the mind itself; sexual desire itself is entirely abolished. But if this is not the consequence, if sexual desire remains, the patient being unable to satisfy it by regular cohabitation, seeks to do so in another, a so-called unnatural way; then arise those strange, repulsive vices and excesses, which in many cases are to be considered as the result of a disturbed activity of the mind. This total inability of producing erections in spite of the existence of sexual desire—furthermore, the complete want of sexual impulse, and also the stated perversions of the latter—may, though rarely, occur as congenital defects; they may also be symptoms of certain psychical disturbances, but in the great majority of cases they arise from long-continued intense abuse of the genitals. Here masturbation plays the principal *rôle.* It exerts the most weakening influence, because it is practised very early, at a time when the genitals have not yet reached their proper development, also because it is very easy to indulge in it, and because it requires great strength of will to shake off the habit. The satisfaction of the sexual instinct in a natural way, however, may also have the same consequences when it is sought excessively at a very youthful age.

Very often, however, other excesses are combined with too frequent coition, and assist in bringing about impotence. Not infrequently individuals who have already been so weakened by excess in venery that erections no longer take place to a sufficient degree, give themselves up to masturbation, since by it the voluptuous feeling can still be excited even when the penis remains relaxed. In this highest degree of sexual weakness the impotence is lasting, and there is no possibility of a return to normal function.

Next to this highest degree of impotentia paralytica of writers, there are many intermediate steps down to a weakened but still sufficient potency for fertility in marriage. Thus after long and intense irritation, there may be a slight erection of short duration; others may have an insufficient erection and no ejaculation; with still others there is an outflow of semen, but before the weakly erect member has been introduced into the female genitals. All these lesser degrees belong to impotence from so-called irritable weakness.

Next to this group of causes of sterility, which mainly depend upon great abuse of the sexual organs, we have another form of impotence called psychical impotence. The characteristic of this form consists in the fact that it is brought about mainly in a psychical way. It proves, after exclusion of severe bodily lesions, to be chiefly a functional disturbance of the organs of generation, in consequence of which there is either no erection at all, or one of so short duration and so incomplete as to be insufficient for the regular performance of coition.

This form of impotence not infrequently developes upon a soil weakened by sexual excesses, that alone would not be sufficient to depress potency down to paralysis, if psychical influences were not superadded. Explanations of the true nature of excesses, especially of masturbation and its consequences, earnest remonstrances and lectures concerning the sexual excesses, the reading of popular literature, that portray the disgrace and harmfulness of the vices in question in too vivid colors, may exert so powerful an impression upon the mind that weakness already present may turn into a complete paralysis of the function of generation. With other patients again they are the first symptoms of the conditions of weakness caused by excesses (insufficient erection, headache, disturbances of digestion, etc.), which conditions produce a psychical depression, perhaps of a hypochondriacal nature, and it is only by these depressions that complete impotence is brought about. That in the etiology of these forms the mind is the important factor is evident, for when these conditions of the mind are partly or wholly removed, an improvement or entire cure may take place.

A peasant, thirty years of age, in the best circumstances, consulted me because he wished to marry, but thought he was not equal to the duties of married life. The history showed that he had formerly masturbated considerably, but had given up the habit ten years ago, having received a severe lecture from his confessor. This exhortation, however, made so deep an impression, that after repeated opportunity for sexual congress he was not able to have a sufficient erection. Being pressed by his relatives to marry, he came to me for consultation; my firm assertion that the damage was not great enough to prevent marriage quieted him perceptibly. Later on he told me joyfully that he had married, that there were prospects of progeny, and that his powers were normal.

Such cases are certainly not rare: in a second case a young man who had formerly masturbated, was, by the reading of a book about self-abuse, entirely deprived of the ability to partake in the sexual excesses of his associates. It was only after earnest exhortation that he could be persuaded to enter married life, which in the future proved to be a fertile one. In a third case a gonorrhœal affection, which had been acquired at the first cohabitation, and had soon been entirely cured, sufficed to interfere with sufficient erections through the first months of married life. Here also, as in the preceding case, the affirmation that the patient was absolutely free from syphilis quieted him, and cohabitation was afterward regularly and successfully performed.

The examples last mentioned form a transition to that group of lighter cases of psychical impotence which may be called temporary. Here neither sexual power is diminished nor is there a want of moral courage, but unexpected obstacles during cohabitation bring about a strong psychical depression, and in consequence of this an excitement sufficient for a repetition of the unsuccessful embrace. These scenes occur very frequently in the first part of married life. Owing to the conditions described under female sterility, the first attempts are unsuccessful; husbands whose consciences are not quite clear are reminded of their past sins and ascribe to these their ill success. The depression of mind caused by this situation may also deter from further attempts. Even with perfectly virtuous men ill success, brought about by lack of dexterity and experience, may lead to a despondency which for a longer or shorter time renders the success of further attempts more and more improbable. With some men a normal condition returns spontaneously; others only reach their aim through the doctor's office; in still other cases sometimes medical assistance (dilatation of the external female genitals) may assist in overcoming the obstacle; but in some cases there result those conditions of the female, which have already been discussed under sterility of the latter (vaginismus, etc.).

But even with some men experienced in the customary transactions of married life, there may occur a temporary psychical impotence. Excessive mental work, sadness, trifling diseases combined with a hypochondriacal state of mind, may abolish generative power for a shorter or longer time. After a removal of the cause there may also be a return to the normal condition. Such cases are also spoken of as temporary impotence.

A certainly infrequent occurrence is the "relative psychical impotence." By this is meant that the impotence exists only toward a certain female, here the wife, while cohabitation is easily performed with others. It is possible, though not very probable, that a young husband may be impotent in his relations with his wife from bashfulness or too great reverence; much more likely are the cases where mental peculiarities, repulsive properties of character, and still more ugly bodily defects of the wife, give rise to a passive behavior of the husband. We must be very careful about the acceptance of this form of impotence. Sometimes when the wife's exterior seems to be very fine, there is still a defect which in the beginning is even kept silent by the husband. Thus I know of one husband who was shocked by an extensive disgusting hairiness of his wife at an abnormal place, and of another to whom cohabitation became repulsive by the discovery that his wife had a false set of teeth.

The occurrence of psychical impotence may be explained by what has been said about the inhibitory influence of the brain upon the sexual activity. This influence becomes efficient the more easily when the centre of sexual activity itself is already in a condition of weakness or paralysis, and when the conduction to the sexual organs has become deficient.

CHAPTER XIX.

THE DIAGNOSIS OF STERILITY IN GENERAL.

IN the section upon the etiology of sterility, we have seen that the cause of sterility may be due to faults in the husband as well as diseased conditions of the wife. Male sterility indeed is certainly less frequent, but still the percentage is so high that really in deciding upon the cause of sterility the condition of both parties should be equally inquired into. Only where the deficiency of one party is very striking should examination of the other be omitted. Thus, for instance, if the history shows that through years of married life the husband has been unable to have any erection, the wife need not be examined; and on the other hand, if an examination of the wife reveals a high degree of cicatricial stenosis of the external genitals, an examination of the husband may be desisted from. But in a great many cases the condition is a different one: if the party first seen should show but slight obstacles to conception, we should insist upon an examination of the other party, such examination of course being absolutely necessary when there cannot be detected any anatomical or physiological defect in the party first seen. Practically, however, this rule cannot often be put into execution; circumstances often compel us to depart from it.

If a marriage remains sterile, it is generally the wife who first seeks medical aid; the husband generally either remains away altogether or at least remains reserved in the matter. The cause of this is not far to see. Medical opinions are gradually absorbed by the laity, who retain them even long after the medical profession have found them to be false. Thus the people still hold the opinion that sterility is almost always due to defects in the wife, and but very rarely in the husband—an opinion which even now it is difficult for us physicians to abandon. We will have to struggle for a long time against this opinion, which prompts the husband to adopt his passive conduct; it will for a long time yet be difficult to make him consent to undergo an examination. Another cause for the wife's initiative is the much greater interest which she takes in her progeny, while the husband regards childlessness as a much less sad affair, and bears it with more resignation. The depressing feeling of having failed in her duty, the fear of displeasing her husband by her sterility or of even causing him to dislike her, brings the woman early to the physician. The painful sensation of having to renounce the pride of a mother sometimes even causes her to seek aid, although the fault is not in herself, and though she may have reason to doubt her husband's potency. But even when the negative result of the examination of the wife calls for an examination of the husband, it is not always easy to persuade the latter to submit to it. His pride sometimes considers it an insult that his ability should be doubted; frequently if he is able to fulfil his sexual duties, he will share the opinion so general among the laity, that the ability to have connection necessarily presupposes ability to beget, and he will consider an examination to be an unnecessary proceeding. In still other cases a certain fear keeps the husband away from the physician, because his conscience is heavy with the sins of his youth. A gonorrhœal affection is indeed rarely concealed from the physician, but it is very difficult for him to confess self-abuse or syphilis.

I can not entirely subscribe to the opinion that it is always the fault of the physician if, after a protracted treatment of the wife, it is found that the cause lies in the husband, for sometimes it is only this ill success in treatment that will persuade the husband to subject himself to an examination. Even if the belief is expressed with certainty, that the sterility is not to be sought in the wife, but in the husband, this is often not sufficient to cause the latter to come. Whatever be the case, in the beginning the wife is often the only subject of an examination; she is also the only source from which the physician can get data for the anamnesis of the case.

In regard to the anamnesis, it is not always very difficult to get the necessary information from the wife, in regard to her married life; on this delicate point a clumsy proceeding on the part of the physician is as undesirable as an investigation clothed in too flowery a style. It does not require much dexterity to put the question in a becoming form, and in proper words. In this way we can make it easy even for a bashful and backward woman to disclose the secrets of her marriage. Sometimes it is difficult for the woman to say at once what she wants—she begins to complain of disturbances of menstruation, etc. The experienced physician soon discovers the true object of the consultation; he can direct the conversation toward the proper theme by a single question properly put.

In taking the woman's anamnesis, we must go back to the time of puberty. The diseases of this period, for instance, chlorosis, must be inquired into. We must let her describe to us accurately the disturbances of her menstruation, dysmenorrhœa, etc., if present. It is of no small importance to know whether a leucorrhœa appeared early or not. Then we must try to become familiar with the sexual relations at the beginning of the marriage, as to time and frequency of cohabitation, the manner of its execution, whether manual assistance was necessary, perfect or imperfect entrance of the penis into the vagina, sexual satisfaction, presence or absence of pain during coitus, discharge of spermatic fluid, etc., questioning, according to circumstances, more or less thoroughly. The women are also able to give information as to the strength and duration of the erections of the males. Should the wife hesitate to reply, either from bashfulness or from fear of exposing herself or her husband, we must make her answers easier by stating, as an excuse, that we put such questions only when necessary, and by pointing out the necessity of the information. Generally we can get all the information that is necessary from the wife, when we have once gained her confidence. If sterility is acquired, we must gather information as to the rapidity of the first conception, as to the occurrence of abortions, course of the delivery and puerperal period, disturbances of the latter (fever, inflammations), suckling of the child, menstruation, changes in the sexual congress, etc. With some bashful women it is advisable not to ask about everything that may be necessary or desirable at once, but rather to supplement our data later.

It is still better, as we have already seen, to hear the husband also, in the absence of the wife. This is indispensable when there is suspicion of male sterility, especially impotence. If the physician has the opportunity to acquire the history from the husband himself, it is not always easy to get a clear account of his previous life. The men will vary among themselves just as much as the women. While some talk very openly about their past life, and do so in a cordial tone, others are very backward, and in spite of all our efforts can not be made to tell us the truth. The information derived from the husband in regard to erections, their strength and duration, as well as in regard to ejaculation, is of course of much greater value than the statement of the wife; often we may also obtain statements in regard to the conduct of the latter during coitus, that modify the information given by her.

Only by the communications of both parties can we obtain a complete picture of the sexual life. Unfortunately we must too often content ourselves with the somewhat one-sided and insufficient statements of one party. It would, however, not at all be to the purpose to confine our anamnesis to the sexual functions; the constitutional condition of both man and wife must be considered. Previous diseases must be thoroughly investigated; in case of the husband we must especially endeavor to learn about former sexual diseases. In view of the many constitutional affections and diseases of organs that lead to sterility, we must, in obscure cases, often make a rigid examination.

CHAPTER XX.

THE EXAMINATION OF THE FEMALE.

WE have emphasized our deficient knowledge of the causes of sterility, and have also called attention to the difficulties that arise in the investigation of etiological conditions. The same thing may also be said in regard to determining the cause of sterility in a particular individual; it is certainly not one of the easiest problems of diagnosis, and this is especially true of the examination of the female. This is mainly due to the deeply hidden position of the genitals, the consequent difficulty of an exact exploration, and the impossibility of following the ovum in its production and onward movement. The great number of obstacles to conception also, and the fact that they may appear in the same individual in manifold combination, render the discovery of the real cause of sterility a very difficult matter. The difficulties that are presented to the examiner by the tenseness of the abdominal wall, the narrowness of the genitals of nulliparæ, and the great sensitiveness of these parts—furthermore, the necessity to subject the most inaccessible parts of the internal genitals to an exact exploration—require not infrequently the employment of an anæsthetic in order to get solid facts upon which to build a diagnosis. A repetition of the examination is advisable here more than elsewhere, not only in doubtful cases, but also in such obstacles to reproduction as our experience shows to be but temporary, or to be subject to change under certain circumstances, as for instance by the approach of menstruation.

The examination does not differ materially from that which is pursued in detecting the various genital affections, but when an affection is discovered, it is necessary to prove that it really interferes with the function of generation.

In conducting the examination we need not always pursue a strict routine; the anamnesis pointing to certain causes of sterility would often lead us in a certain direction. Thus vaginismus would at once indicate an examination of the external genitals. But it must be especially emphasized that we must not content ourselves with the discovery of one cause of sterility, even when it seems to be a very plausible one, for, as has been remarked several times, there often exist in the same woman several obstacles to conception, of which that which seems least important may have much more weight than that which more clearly presents itself to us. Thus a high degree of stenosis of the cervix might appear to be the etiological factor, whereas the remains of a perimetritis that is imperfectly demonstrable by band-like thickenings in the pouch of Douglas, may be the much more probable cause of the sterility.

As has been said, the ordinary exploration of the genitals suffices for the determination of the cause of sterility, except in a few points about which we will now make a few remarks.

If the history directs our suspicion to an affection of the external genitals, it is advisable to subject these at first to an ocular inspection before proceeding to the ordinary examination by touch. Not only can the entire series of affections of the external genitals that cause sterility be best recognized by the eye, but if a digital examination be made at once, there may be produced changes in the ostium vaginæ due to irritation which might then be mistaken for inflammatory changes and *vice versa.* Care is also necessary in judging of the sensibility. Some women give expression to great pain during the digital exploration, and offer a decided resistance to it. It would be wrong to judge from this at once that there is hyperæsthesia during coitus, for upon questioning the somewhat experienced husband, it may be determined that this act is performed normally. This point may also be further determined by a repetition of the examination when, after the first bashfulness and fear have been overcome, and upon firm conduct on the part of the physician, it may take place without pain. On the other hand again the genitals are sometimes sensitive only during cohabitation, and render it difficult or impossible, while the finger will be admitted without pain or obstacle. Thus, I am now treating a woman who eight years ago was delivered of a dead child by the aid of the forceps, and who since then has been sterile; coitus has for a number of years been imperfect on account of an inflammation of the ostium vaginæ, while the finger can dilate the external genitals without causing pain. Sexual excitement and the improper direction of the penis bring about the abnormal sensation in the first case, while these factors are absent in a careful examination. Little weight is to be attached to the presence or absence of a hymen, in ascertaining whether there is an obstacle to cohabitation produced by the external genitals. Neither does the former condition speak for, nor the latter against an obstacle, for it is understood that cohabitation may take place with an intact hymen. With the great laxity and dilatability of the genital canal, as seen in some women, it is often possible to make extensive digital and specular examinations without injuring the hymen. On the other hand the hymen may have been torn during the first cohabitation, but may yet by its sensibility forbid the entrance of the penis.

As regards the examination of the vagina, what has been said about hyperæsthesia of the vulva is also true of this canal; the specular examination must not be omitted, as not infrequently a catarrhal inflammation proves to be the cause of the sensitiveness.

Special attention must be paid to the secretion of the vagina. In the first place its chemical condition must be investigated, for which purpose blue litmus paper will suffice. Care must, however, be taken that the paper does not come in contact with the cervical mucus, which has descended into the vagina, a secretion which is distinguished from the vaginal mucus by its transparency and tenacity. If the litmus paper changes to a deep red, if, therefore, the reaction is acid, it is possible that the spermatozoa perish in this secretion before they reach the cervix. The more intensely acid the reaction, the more probable is this assumption. If, moreover, a microscopical examination immediately after coitus should discover spermatozoa that are dead, or have but little motion, the suspicion is still more justified; but a detrimental influence of the secretions upon the sperma can be accepted as certain only when the semen, taken directly from the male urethra, shows an active motion. But these investigations are only of value when instituted immediately or very soon post coitum, since we know that after a time the spermatozoa lose their power of motion in the vagina.

By means of the microscope we can detect the presence of pus corpuscles, and we should recollect that the zoosperms are very intolerant of inflammatory catarrhal conditions. If the mass of fluid, also, is too great, the zoosperms may be washed away from the cervix.

It is well to warn the patient not to use any injection for some time before the examination, since thereby the nature and reaction of the vaginal secretion might be changed.

The chemical reaction of the cervical mucus is of much less importance, for the spermatozoa can better bear a much more alkaline reaction than the acid vaginal secretion. The portio is to be cleaned after the speculum is introduced, and a piece of litmus paper passed with the forceps into the cervical canal. Probably the amount rather than the alkalinity of this secretion does harm, especially if it is more or less purulent in its nature, as it sometimes is. Since we are here dealing not with the secretion only of the cervical canal, but with that of the entire uterine cavity, which may be, as in endometritis chronica, a cause of sterility, it would be advisable to use the process recommended by B. Schultze, and collect the uterine mucus by means of tampons for examination.

Of the remaining uterine affections which might hinder conception, only those which displace or narrow the uterine canal need special mention. Examination by palpation, by inspection, and with the sound is necessary if we would not be deceived as to the size of the external os. If it can hardly be felt, if a sound whose extremity is 2$\frac{1}{12}$th inch in diameter, cannot be passed through it, and if it appears as a small red spot with a mucous plug attached to it, we can say that it is stenosed. Stricture of the cervix may be diagnosed when a sound of this size cannot be introduced beyond the external orifice, or when it can only be introduced with difficulty and pain, or meets a succession of obstructions in its passage. As regards stenosis of the os internum, the bent corpus uteri must be left in its abnormal position, and the attempt be made to pass the sound into its cavity. By the amount of opposition that is met with, we can judge of the amount of stricture at the internal os.

If the external os uteri is not stenosed, and we have yet reason to believe that the obstacle to conception lies in the cervical canal, the os externum must be dilated, and the cavity of the cervix explored. If, however, the os externum is very large, and if the impression given to the examining finger is that the cavity is very extensive, and if the sound can be freely moved about in it, the cavity of the uterus must be further explored. If we suspect new growths in the uterine cavity, we must render it accessible to the examining finger, though as a rule curetting the cavity without previous dilatation will be sufficient. The microscope will aid us in determining the existence of various affections of the internal surface of the uterine cavity (endometritis chronica, etc.), which might render the growth of the ovum impossible.

We must search with especial care for the remains of inflammatory processes in the neighborhood of the uterus, since these, as we have seen, may interfere in various ways with the functions of the ovaries and the conduction of the ovum. Diffuse thickening and band-like masses are of more importance in this respect than easily-recognizable exudations in the parametrium or in Douglas's pouch. If on examining bi-manually or with the sound we find that the uterus is fixed posteriorly or to one side, and if, when we attempt to bring it into the median line, the soft parts between uterus and pelvic wall are put markedly upon the stretch, we can assume the existence of cicatricial adhesions and bands. Sometimes we can feel them plainly.

The examination of the ovaries is of the greatest importance. If this be effected under chloroform, we can determine their condition with considerable accuracy. The right ovary should lie somewhat posteriorly, and the left to one side of the uterus. If in their place we recognize hard, not distinctly limited, and more or less fixed masses, the ovaries are probably enveloped in exudations and pseudo-membranes. If we find sharply circumscribed, movable, variously-shaped bodies, of lumpy surface, and much larger than the ovaries, there exists chronic oöphoritis and cystic degeneration. If we can only with difficulty find two small bean-sized and often irregular bodies, there is atrophy of the ovaries. But we must be careful in accepting a negative result. Tense abdominal walls, abundant pelvic fat, and the resistance of the external genitals, may prevent our finding one or other ovary (especially the left), even with the aid of chloroform. Nor must we forget that it is possible to mistake hardened intestinal contents and sharply-circumscribed small exudations for ovaries.

Finally, we must again warn the examiner against devoting his attention too exclusively to the sexual side, and neglecting the constitutional relations of the married couple, both as regards the history and the physical examination. Examination of the genitals alone is insufficient.

CHAPTER XXI.

EXAMINATION OF THE MALE.

THE examination of the male *quoad genitalia* is much more simple than that of the woman. Not only are the organs much more accessible, but the maladies causing sterility are much less numerous, and, when not of nervous origin, cause much more palpable local disturbances. On the other hand, male unfruitfulness is much more commonly due to diseases of distant organs or of the general system; and our examination must be consequently more extensive. With honest patients, however, the history will help us far more than it will in females. But the most important help in diagnosis comes from the fact that the male principle of conception, the sperma, can be directly examined.

We can best explore the genitals by taking them in order; testicle, epididymis, cord and penis. We can thus decide whether any congenital defect or disease which might cause sterility is present. The condition of the prostate, the seminal vesicles, and the parts in their neighborhood must be found out by rectal examination, and the existence of cryptorchidism may sometimes be decided in the same way. The penis must be inspected and palpated. If stricture is suspected, the catheter must be used, and in some cases the deeper portions of the urethral canal must be inspected by endoscopy after Grünfeld's method.

If the history points to disease of other organs, or of the system at large, we will be confronted by the difficulty that the malady causing the sterility is often in its earliest stages, and marked symptoms may not be present to enlighten us as to the diagnosis.

If the facts elicited point to former abuse of the genital function, we must obtain information as to the nature, duration, and extent of the sexual excesses, as also as to the present state of the sexual functions (erection and ejaculation). It is important to find out whether spermatorrhæa exists with the genital weakness.

It is different if the history shows that we probably have a temporary or psychic impotence or sterility to contend with. If we believe this to be the case, we may postpone examination of the genitals.

But if the genitals appear normal, and cohabitation also, we must suspect some fault in the spermatic fluid itself. The conclusions reached as to the activity of the zoosperms in the female genital canal vary, and the results of experimentation upon animals cannot be confidently applied to men, and it is, therefore, advisable to examine the contents of the vagina as soon as possible post coitum. Any examination made more than twelve hours after intercourse is useless. All gynecological treatment and vaginal injections must be suspended for several days before intercourse, and thereafter; since we know that apparently harmless things will influence the sperma. All instruments used to remove the semen from the vagina must of course be very clean and quite dry. The secretion of the cervical cavity can be removed by means of a fine syringe, or by Simon's smallest spoon curette, or with a camel's hair brush, and then examined under the microscope—remembering that while the cervical mucus contains far less spermatozoa than does the vaginal, they remain alive much longer in it.

The vaginal mucus may be removed with the dry forefinger, or the speculum may be introduced, and enough will be found adherent to its apex when withdrawn to suffice for all practical purposes. The secretion should be at once examined under the microscope.

The result may vary much. If we have taken vaginal secretion, the entire field may be so filled up with spermatozoa that other objects present, epithelium, crystals, granules, may be quite invisible. In other cases zoosperms may be nearly or quite absent. If the result is negative, repeated examinations should be made; for even a short time after coitus the semen may lie in one coherent mass in the vagina, and we may fail to get any of it in the mucus we collect. Nor must we forget that the zoosperms soon scatter in the vaginal fluids, and that a small number of them in a specimen collected late by no means necessarily implies a deficient amount of semen. And besides, the semen flows away out of the vagina after copulation. Both vaginal and cervical mucus should be examined before it is decided that the zoosperms are absent.

The zoosperms may all or in part be in active motion, but even if they are not, it does not prove that they are dead. A weak alkaline solution (kal. caust. 1:1000) may be added, which will perhaps restore motion to them when quiescent.

Our conclusions will vary in accordance with the results obtained. The presence of numerous zoosperms in active motion will of course exclude all doubt as to potency, but their absence or immobility does not justify us in adopting the opposite conclusion, and this for the reasons above stated. The time which has elapsed after cohabitation has been too great, and another and more prompt examination is necessary, or the semen is that voided at the last of several rapidly succeeding cohabitations, when it should be that of a single one after more or less prolonged abstinence. In elderly or weakly individuals the examinations should take place after lengthy periods of continence, before we decide as to the amount of spermatozoa present.

Motionless spermatozoa may have been ejaculated in that condition, or they may have become so from causes resident in the female organs alone. If the woman is alone accessible to examination, a search immediately after cohabitation will be too prompt to permit the vaginal secretions to act upon the mass of zoosperms and kill them. If this does not succeed, we must endeavor to neutralize the acid vaginal secretion immediately before coitus, by washing out the organ with a dilute alkaline lotion. To decide whether the zoosperms are inactive merely or dead, the procedure recommended above may be employed.

Hausmann has shown that the spermatozoa have all disappeared from the vaginal fluids thirty-six hours *post coitum.* They may still persist in the cervical mucus. But even if we decide that they are entirely absent, we should not do so till after repeated examinations, since azoospermatism itself may be only a temporary phenomenon.

Sometimes it is impossible to obtain the genital secretion in the fresh state, and we are compelled to rely upon dry preparations. The secretion that flows out of the vagina after intercourse may be collected upon clean fine linen, and permitted to dry there. These semen spots are then to be moistened with a very small amount of distilled water, scraped, and placed under the microscope. Or, if the spots are moistened with an ammoniacal carmine solution, the spermatozoa will appear more characteristically. It will not be superfluous to remind the reader that fibres of tissue may easily be mistaken for spermatozoa that have lost their heads.

In this manner the existence of zoosperms, though not their motility, may be proven. But the absence of the zoosperms in semen stains is less certain as a proof of male sterility than their absence in the vaginal secretions, since the stains may possibly consist simply of the secretions of the external genitals.

If the above-mentioned methods of obtaining the semen are not sufficient, we must endeavor to get it directly from the man himself. He may wipe his glans and express the contents of the urethra upon clean linen immediately *post coitum*, or, better still, may practise intercourse with a condom, and bring the semen thus obtained for examination. But the examination may be best of all conducted by taking the semen directly from the male, though this is sometimes quite impossible. Immediately after coitus, or at all events before the first urination, the remnants of the semen are to be expressed from the urethra, and examined directly. If we find on repeated examination made in this way that no zoosperms are present, the man is undoubtedly sterile.

If we find spermatozoa, but always motionless, they have died during their passage through the seminal canals, and probably from disease of these latter. According to A. Schlemmer, the other organized components of the semen increase as the zoosperms decrease. If the zoosperms are in active motion, the cause of the sterility must be sought in the female.

If aspermatism is present, there will be no fluid in the urethra to be examined. It must not be forgotten, however, that certain obstacles may cause the semen to flow backwards into the bladder, and in these cases the urine at the next micturition should be examined for spermatozoa.

But not only the presence and motility of the zoosperms should be examined into, their size and shape should also be noted. Though we have as yet no exact data upon the subject, it seems probable that these factors are not without influence upon the capacity for procreation. Small-sized spermatozoa, especially, are to be looked upon as imperfect formations, though natural in those under puberty, or who have reached old age. It is a question if they may not be the cause of sterility if found in adults. Of course if excesses in venery have occurred, immature zoosperms may be detached and prematurely evacuated. Spermatozoa also are found in which the head has become detached from the body; and although, as has been claimed, these are in many cases artificial productions, they will be found in some of the most carefully made preparations, and demand our consideration. The addition of moderately dilute solu-

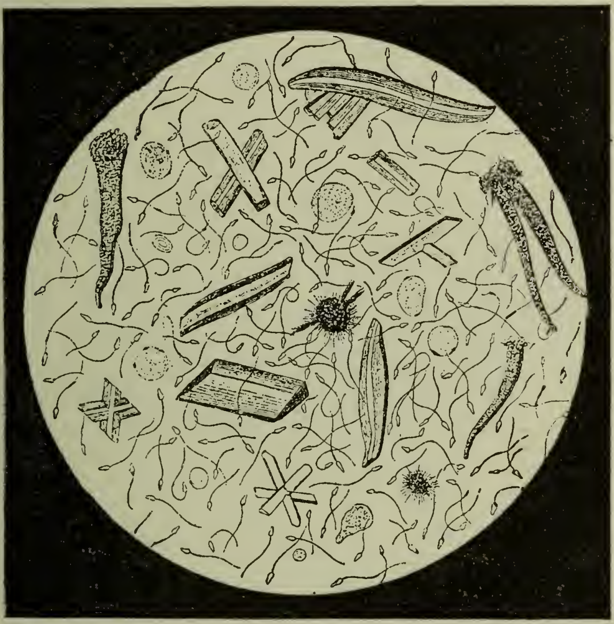

Fig. 1.—Normal Semen. (After *A. Peyer.*)

tions of tincture of iodine, or staining with ammonia carmine, will render these abnormal formations more distinct.

The microscope will not afford us the important and often conclusive help in cases of impotence that it does in cases of aspermatism and zoospermatism. Yet it may be useful in cases of impotence, where there occur involuntary urethral discharges, a condition formerly called spermatorrhœa. Is this fluid the abnormal secretion of the accessory glands, especially of the prostate (prostatorrhœa), or is it really semen? The absence of zoosperms upon the one hand, and the presence of bodies derived from the accessory glands upon the other (as the amyloid bodies found in prostatorrhœa), will decide, though repeated examinations may be necessary. Fürbringer has demonstrated that the transparent rhomboidal spermacrystals, which were supposed to be characteristic of the semen, are found in the prostatic and other fluids, but are not present in the testicle at all; they are, therefore, useless for diagnostic purposes.

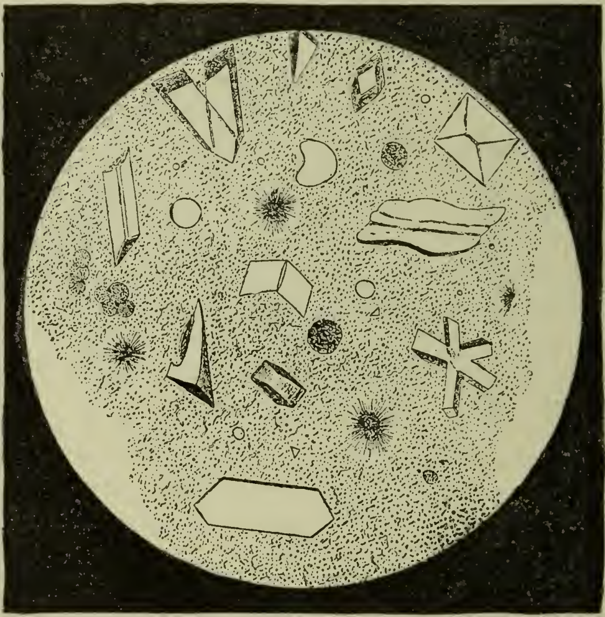

FIG. 2.—SEMEN OF AZOOSPERMATISM. (After *A. Peyer*)

Electricity will be rarely needed for the diagnosis, though it may be necessary for the treatment of impotence. But many other organs and the general system must be carefully examined in cases of sterility. The urine must be examined if diabetes or Bright's disease is suspected.

CHAPTER XXII.

THE PROGNOSIS OF STERILITY IN GENERAL.

AFTER having considered the various causes, frequency, and distinguishing marks of sterility, we must say a few words as to its prognosis before proceeding to the treatment. The Hippocratic axiom as to the importance of the prognosis is certainly applicable here. And first and foremost, in estimating the patient's chances of recovery, we must decide whether the sterility is an absolute or only a relative one, whether in fact conception may not occur without any interference upon our part. If the hindrance to conception is an absolute one, the prognosis is always unfavorable—if it is only a relative one, the prognosis will vary in the different cases. But not only will the nature of the obstacle influence our conclusions, the complications, if any are present, will also do so. The length of time during which infecundity has been present must also be considered, for we have seen above how rapidly fecundity diminishes after a certain period of married life. Pregnancy after five years of sterility is a relatively very uncommon occurrence. Nor must it be forgotten that, in the married relation, the prognosis depends upon the behavior of both individuals, and not alone upon the one in whom we discover the obstacle. Not only in the newly married, but later also, normal or heightened bodily potency, moral self control, and also a certain amount of adroitness and pliability in the act, may do much to obviate the difficulty.

The consideration of all these points will enable us to reach a prognosis. In those cases in which no diagnosis or only an uncertain one is made, we can simply regard conception as a future possibility.

The prognosis is entirely different as regards the curability of individual cases of sterility. There are curable and incurable cases among both the relatively and absolutely sterile. Thus, absence of the uterus is an absolute hindrance, but so also may be extensive deformity of the external genitals, though it may be remedied by operative procedure when the internal genitals are normal. And the same is the case with the male. A preputial lipoma as large as a goose's egg is an absolute obstacle (such a man brought his wife to a prominent gynecologist to be examined for sterility ! !); yet a simple operation will enable cohabitation to take place, and remove the sterility. Marked atrophy of the testicles, however, will prove an obstacle which persists in spite of all treatment. We see the same difference in cases of relative sterility. Sterility due to marked flexion of the uterus may be remedied by appropriate treatment, while a simple genital catarrh may in spite of all our efforts continue to prevent the zoosperms from reaching the ovum. And in the male again an apparently simple and long past gonorrhœa may absolutely destroy the procreative power, while extensive scrotal hernia may be remedied surgically, so that intercourse can be effected and conception procured.

It would be interesting to know how many of the special causes of sterility can be remedied by medical aid But the statistics which we possess are unreliable. Treatment, in females especially, may be begun very early, and to nature is due a large part of the credit which the physician assumes. Only cases where sterility has lasted four years, and where conception occurs within six months after the conclusion of the course of treatment, should be considered. The statistics of my own cases, made in this careful way, show a percentage of not more than twenty to twenty-five cases cured. This is not very satisfactory, and is by no means what was expected when the mechanical treatment of sterility was inaugurated. But on the other hand these figures do not sustain the extensive pessimism which has lately sprung up in regard to the treatment of sterility. The low percentage of cures will render us cautious in stating the probabilities of the case to our patients. I never omit to tell my patients at once that out of four or five cases one only can be cured, and that it is impossible to tell beforehand whether or not she will be the lucky one.

As to the prognosis of the special causes of sterility, we will have more to say under the head of treatment.

CHAPTER XXIII.

ON THE TREATMENT OF STERILITY IN GENERAL.

THE treatment of sterility is not the easiest or pleasantest task in therapeutics. The difficulties which we encounter have already been considered, but it will not be out of place to recapitulate them here.

The first of these is our imperfect knowledge of the etiology of the condition. In only a little more than half the cases can we decide with certainty upon the cause of the infecundity. In other cases again we are compelled to deal with probabilities. In a small number of cases we are confronted by suspicions only. Compelled to do something, we attack to-day this and to-morrow that abnormality which might entail sterility. Sometimes we hit upon the right thing, but we do not have that feeling of satisfaction at the result which flows from a certain diagnosis and an appropriate line of treatment. Nevertheless, when we consider the not infrequent cases where for years treatment of the most varied kind is persisted in by different physicians without result, we cannot but feel a certain satisfaction.

Another obstacle to treatment is found in the fact that several causes of sterility may be present in one and the same individual, and one of these may be the only really active cause of the unfruitfulness. If now at our examination the unimportant conditions assume undue prominence, we are liable to underestimate or neglect entirely the true cause of the infecundity.

We are often also confronted with the difficulty that only one of the couple, usually the woman, is at our disposal for examination and treatment. Now in the female sterility occurs in connection with a large number of genital affections, and frequently with such as do not give any other evidences of their existence. They are not necessarily the cause of sterility, nor do we know the conditions under which they become so. These maladies are very common; it is not improbable that they are often diagnosticated and treated as the cause of the sterility, while in the male resides the true cause of the infecundity. Kehrer's experiences would show this to be quite common, and it is to be hoped that the public will soon lose this idea, which physicians have given them, of the entire innocence of the male as a cause of sterility in marriage.

How then shall the physician, knowing the etiological, diagnostic and prognostic relations of sterility, and the difficulties of its therapy, conduct himself? A few hints will not be out of place.

What shall we say when examination reveals an insuperable hindrance to conception? Here we must individualize. In cases where in spite of the desire for offspring the reasoning is stronger than the sentimental side of the Psyche, or where for years all imaginable cures have been uselessly tried, and hope is almost gone, here the whole truth had better be told. Monetary and other sacrifices are thus avoided, and the long period of anxiety and desire is brought to a close. But when the couple are of nervous and impressionable temperament, and it would not be humane for the physician to expose to them the true state of the case, he should advise against any local treatment, direct their attention to general treatment, and use, if it must be done, remedies for any indication which may be present. But the patient's friends should be told the full truth.

As to the treatment of curable cases, it is easy to institute it when any abnormality is positively recognized as the obstacle to conception. But even when we only recognize a probable cause, it is proper to treat it without insisting upon an examination of the patient's partner.

It is different, however, when examination reveals only probable causes. Here the physician must insist upon a thorough examination of both parties.

The question arises as to whether the physician is to continue his examination when one of the couple will not submit to examination. I think he should, provided that the state of affairs has been made quite clear to the patient that consults him, and an earnest effort has been made to obtain an examination of the other party.

Unfortunately the surgeon will frequently be compelled to treat doubtful hindrances to conception in the female, and he must beware of bestowing too much attention on one anomaly, and should always keep in view the other, even if apparently less important, obstacles. Nor should advice as to other matters, even when resting upon theoretical grounds, be neglected. There are many such. I need only mention the coitus *more bestiarum* in retroversio uteri and the vaginal injection of chemical substances to neutralize the evil influence of certain genital secretions upon the sperma. They are justifiable when other rational means have been exhausted, and when they are not opposed to common sense. We daily use means of just as doubtful efficacy in other branches of medicine, without any scruple as to their scientific legitimacy. And it must be remembered that sterile women, to whom we hold out no hope, fall an easy prey to charlatans. Many sterile women persist in treatment for years, and if there is any chance for them at all, we should treat them as if some real and tangible malady were present. The treatment of these cases is not one of the pleasantest tasks in medical practice. As Billroth says, this also must be borne with "Anstande."

So much for the relief of sterility in general. As far as individual cases go, their treatment will in a general way be that of the abnormality which forms the obstacle to conception, and the reader will find in the various text-books on internal medicine, surgery and gynecology, full directions concerning the treatment of the diseases of the male and female genitals, or of the general system, which lie at the bottom of the condition.

In other cases the cause of the sterility cannot be remedied, or its cure is too troublesome and would take too long; it may then be possible to relieve certain secondary conditions which form the special hindrance to conception. This relief need not even be permanent; it is only necessary to remove the obstacle at the time when zoosperm and ovum are to unite. This is the case not only with the temporary removal of mechanical hindrances, such as the dilation of stenosed parts, but also with the removal of complications or the improvement of the malady at the root of the trouble, as, for instance, the curetting of the uterine cavity in chronic metritis. In these cases we may, therefore, undertake a special and specific treatment of the sterility, and this will form the chief part of the succeeding chapter.

CHAPTER XXIV.

TREATMENT OF FEMALE STERILITY.

IN the female, in treating sterility, we have to deal either with constitutional diseases or local disturbance, with the exception of the small number of cases due to general causes.

Among the constitutional causes of sterility excessive youth has been mentioned; and here the physician can do but little, since he will hardly be able to enforce continence upon the married couple. But he can help prophylaxis by opposing too early marriage, especially with poorly-developed, chlorotic individuals. It will most often be his task to treat disturbances in the genital sphere caused by premature sexual activity, and thus render conception possible.

Not infrequently the gynecologist is consulted on account of deficient sexual sensation.

Most often the husband appeals to him, sometimes the wife's relations, and occasionally the wife herself, when sterility is present at the same time. Can anything be done pharmaceutically to remedy the deficiency? It has no influence upon the sterility, nor will its relief in any way affect it If the abnormality is due to congenital absence of the ovaries or of the central organs of sexual activity, medicines will hardly cause any improvement. It is a question whether in this way we can recall sexual sensations which once were active. If we consider the great extent of the therapeutic armamentarium of the earlier gynecologists for the increasing of sexual passion, and remember that no one of their many remedies has maintained its place, we may well doubt, in the female as in the male, whether any drugs at all are to be relied upon. I have not been able to investigate the subject, and there are no experiments by others available.

Nervous influences also, especially dysmenorrhœa, which are regarded by many as the essential cause of sterility, do not need consideration therapeutically here, since they cannot alone hinder conception. Dysmenorrhœa is to be regarded as a symptom only, and not as an idiopathic malady, and its causes, if they hinder conception, are to be attacked. We have spoken above of the influence of nutrition upon fecundity, and of the connection between obesity and sterility. Rapid and excessive increase of fat, especially when menstruation becomes scanty or disappears, and when it comes on soon after a confinement, lessens the prospects of pregnancy. A few striking cases there are in which by treatment of this condition the sterility has been relieved, but they are a minority, and we must not look forward too confidently for results. Nevertheless we should not neglect it. An appropriate regimen, with courses of mineral waters, among which those of Marienbad are most reliable, are the essential points of treatment. When obesity is accompanied by scanty menstruation, it might be proper to attempt to restore the function to its entirety by means of local irritants. The conditions permitting it are the same as those in chlorosis, but the contra-indications are rarer than in that malady.

No special mention need be made of the various measures to be employed in chlorosis; a roborant diet, residence among the hills, iron and steel, are to be used. To some of these latter is ascribed a specific influence favoring conception. With nervous individuals prolonged sexual continence is advisable. It is questionable whether it is wise, when scanty menstruation or amenorrhœa is present, to use local measures to relieve these, and to attempt to cause ripening and dehiscence of the follicles by the genital congestion which ensues. Such treatment is locally irritating and may increase the general malady, and especially the nervous symptoms, or it may excite or exacerbate some local malady. On the other hand it must not be forgotten that several practitioners have succeeded in relieving amenorrhœa and curing sterility by means of warm water injections, the application of leeches to the cervix, the introduction of sounds, etc. Some (especially E. J. Tilt) regard irritation of the mammary gland as a powerful excitant of the genital system. But in spite of all this we should be careful, and reserve such treatment for cases where general therapy has been persistently carried out for years without effect, and the condition of the genitals affords no direct contra-indication to the measures which we are about to employ.

Scrofula and tuberculosis, as we have said, do not play a very prominent part in the etiology of sterility; nevertheless, if we find in sterile women no anomaly save the first symptoms of these affections, it would be proper to employ mud-baths, change of climate, etc., to combat them.

If alcoholism is the cause of the sterility, as A. Duncan has claimed it is in some cases, it must be appropriately treated.

As regards venereal diseases, we have said enough above in regard to female gonorrhœa as a cause of sterility. The catarrhs so caused need persistent local treatment, as do the consecutive inflammations (para- and perimetritides). Unfortunately purulent tubal catarrh and peritoneal inflammations are not accessible to direct treatment, and thus the prognosis of chronic cases is always very doubtful.

Constitutional syphilis demands appropriate treatment, and since it is so frequently complicated with gonorrhœa, the local condition of the genitals should be carefully kept in view. The results of antisyphilitic treatment, if we reckon *impotentia in gravescendi* as sterility, is often very remarkable; the abortions cease, and normal pregnancy and delivery occur.

In the second group of causes of female sterility, local maladies, disturbances, and diseases of the genitals, local treatment is necessarily the most important. We will begin with those dependent upon the ovaries.

Rudimentary ovaries—or absence of the ovaries—are usually combined with other anomalies of the external genitals, which would render conception impossible; no treatment is to be thought of.

Premature atrophy of the ovaries also cannot be treated. It must not be forgotten, however, that scanty menstruation, or its disappearance, does not always point to this condition. And on the other hand we should not forget that with the beginning of the third decennium fecundity diminishes, and in the sixth lustrum conception is a rarity. Chronic inflammation of the ovaries, in which I include cystic degeneration, can hardly be relieved as far as the sterility thereon ensuing is concerned, since, as a rule, both ovaries are affected. The appropriate measures are those proper for the treatment of the perioöphoritis and perimetritis, which are always present. I have above drawn attention to the fact that acute puerperal peritonitides may cause destruction of the ovarian follicular apparatus, and consequent sterility. In that case, of course, we have no means to restore the organs to their former condition. Nevertheless, amenorrhœa persisting after lactation is ended is not always due to ovarian changes. After excessive hemorrhages, difficult labors, and mild puerperal inflammations, there often remains a chronic anæmic condition without any material disturbance of the genitals, and giving neurotic symptoms. In this case the condition can be cured.

For the larger ovarian tumors the physician will be consulted apart from the sterility. Most of these patients have passed the period of fruitfulness, and the frequent involvement of the second ovary renders the prognosis exceedingly unfavorable.

When the tumor is small, growing slowly, and unilateral, ovariotomy may cure the sterility. But the prospects are doubtful, the operation is dangerous, and the decision should be left to the patient herself.

We have seen above the frequency with which pathological conditions of the peritoneum cause sterility. Of the congenital anomalies, a number cannot be recognized during life, as, for instance, a want of connection between the ovaries and the fimbriated ends of the tubes. In other cases, as where the ovaries lie in a hernial sac, mechanical treatment will be applicable.

But of much greater importance in causing sterility are the inflammations of the pelvic peritoneum and the parametrium, as well as hematocele. The more recent the remains of such processes are, even if large in amount, the better the prognosis. If firm bands and cicatricial masses have already formed, causing adhesions and displacements of the pelvic organs, the prognosis is not a very favorable one. There have been cases, however, where absorption of the inflammatory products has occurred even after lengthy periods of time; and we are entitled to attempt to render conception possible even in these apparently hopeless cases. The treatment is the ordinary one for the affection in question; of more recent remedies, hot-water injections, iodoform sprays, and massage, are to be recommended.

It is very questionable whether it is proper to use a mechanical plan of treatment in conjunction with the dietetic pharmaceutic course. The danger of exciting renewed inflammation and hemorrhage would prevent our attempting to remedy adhesions by manual exertion or instruments, like the uterine sound; nor could we do better with laparotomy. But there are cases in which recurrent local inflammations appear at one side of the pelvis. They may be combined with sterility, and then the ablation of one ovary, perhaps together with the corresponding tube, may cure the inflammation and permit the other ovary to functionate properly. But in all these operations the benefit to be obtained is so problematical, and the dangers yet so great, that their consideration as remedies for sterility may well be left to the future.

The tubes, which are certainly of importance in the causation of sterility, are less accessible to special treatment than is the peritoneum; nor do the congenital and most of the acquired tubal anomalies permit of an exact diagnosis. Nor have we either local or general means for combating their diseases. Catheterization of the tubes, or cauterization of the mucous membrane, however advisable theoretically, cannot yet be done. Inflammatory conditions of the tubes, with their consequences, strictures and obstructions, cannot be directly attacked. Dislocations of the tubes can hardly be diagnosed, and constrictions and atresias caused by peritonitic processes can only be treated by removing the inflammation.

As to uterine malformations, entire absence or rudimentary formation of the organ cannot be treated, and are of bad prognosis. Duplexity of the uterus permits conception; cohabitation only may be interfered with by a vaginal septum. Retention tumors of the uterus, projecting into the vaginal canal, must be treated operatively. The stenoses of the genital canal, so frequently left after these operations, must be treated like the constrictions of the cervix.

The higher grades of congenital smallness of the uterus are of unfavorable prognosis. We may attempt, as in cases of acquired atrophy, by improving the general health, by local irritants, (hot vaginal douches, cauterization of the uterine mucosa, the introduction of sounds, electricity, etc.), to cause increased uterine nutrition, but the results of treatment have been so discouraging that, if the period of genital growth has passed, we may as well give up all such attempts. In cases where the deficient size is not so marked, and where anæmic-nervous symptoms and slight non-pathological flexions are present, the case is different; the prognosis is better, and conception may possibly occur. Here again the care of the general health is of more importance than the use of local irritants. These latter are liable to set up catarrhal processes, and they do not tend to relieve the general symptoms of chlorosis and nervousness, but the reverse

In sterile women who have married very young, and in whom imperfect uterine development and the changes of the genitals caused by cohabitation prevent conception, a prolonged continence is indicated.

When the vaginal portion is absent, and there is conical elongation, operative procedure only can be relied upon. Its exact nature will depend upon the length of the vaginal portion. If it is but small, it will suffice to enlarge the os uteri; if it is longer, a portion of it must be ablated, thus giving the os externum a higher position in the cervical canal, and increasing the possibility of keeping it open.

As we have seen, hypertrophy of the vaginal portion, or of one lip of the os, can only cause sterility when it is large or occurs conjointly with other changes, such as stricture of the os and cervical canal, or intense cervical catarrh, etc. In this case there is no remedy but amputation, with subsequent care to maintain the patency of the canal.

Hypertrophy of the supra-vaginal portion of the cervix demands the usual treatment for that condition.

Cervical stenoses play an important part both in the etiology and the therapy of sterility, though they are not considered of as much consequence to-day as they were some time ago. If we find the os externum of a nullipara to be too narrow, and especially if a large collection of mucus forms a still further hindrance to conception—and no other manifest cause for sterility, such as exudation, is present—dilatation of the cervix is indicated. We may first try to effect this bloodlessly, using the dilators of Peasley, Ellinger or J. Schramm, etc., though we will often partially rupture the cervix in our attempts. If this does not succeed after repeated trials, we should incise the orifice at either side, and then try by suitable treatment to enlarge the canal. This may be done without anesthetization or special preparation. If these simple measures do not suffice, we must adopt more radical means. We must remove enough tissue to give the necessary width to the orifice, and then unite the cervical and vaginal mucous membrane; thus placing the os higher up in the wider part of the cervical canal, and preventing too great contraction. The exact methods of operation are detailed in the treatises on gynecology. I formerly removed the apex of the vaginal portion, and then united the mucous membranes of the four sides, giving the os a rosette-shape. Later, however, I followed Schröder's procedure exactly.

The same plan may be followed in those rare cases in which women have borne children, and are suffering from consequent cicatricial stenosis.

Some authorities claim most brilliant results from this operation. E. Martin has done it 384 times for sterility; 97 women, 25 per cent., afterwards conceived. G. Braun saw pregnancy occur in 23 out of 66 cases operated on, 34 per cent. Chrobak has collected statistics from various sources, showing the successes to be about 30 per cent. The frequency with which some physicians have done this operation lays them open to the criticism that the stricture of the os cannot always have been such as to demand discission; and that perhaps the results have been regarded too much in the light of "*post hoc ergo propter hoc.*" Hegar and Kaltenbach rightly call attention to the fact that other changes of the vaginal portion, which might prevent conception, are removed at the same time; vaginal catarrh is cured, and the plug of mucus removed. Nevertheless there are a large number of cases in which pregnancy does occur after the discission; and, from the absence of danger in the procedure, it is to be recommended that an os as large as is natural in the fully developed uterus be made in this way.

As regards stenoses of the cervical canal itself, we have seen above that a general narrowness in nulliparæ frequently occurs in connection with general under-development of the organ. Yet the abnormality may occur alone. Acquired stenosis, however, is a much severer malady, and appears especially as cicatricial bands and flap-shaped projections. The tendency to recontraction after dilatation renders this form especially hard to treat; and the malady causing the cicatricial stenosis (gonorrhœa or severe childbed diseases) has frequently caused other disturbances in the genitals and their neighborhood, which require special attention. We must here act as in flexions of the uterus, since a temporary dilatation will sometimes suffice to relieve the sterility. We should dilate the canal, either rapidly with sound-like instruments, or more slowly with dilators. Intra-uterine pessaries may sometimes advantageously be left *in situ*. Thus in a woman who had marked stenosis of the entire cervical canal, in consequence of a severe labor six years before, a uterine stem was left in place a whole year by mistake. She bore it well, however, and half a year after removing it I could still easily introduce a sound. But the tendency to recontraction is such, that in women who desire their sterility to be removed at all hazards, I always proceed to operation. The operation is attended with but little danger when the stenosis is not very deep-seated and full antiseptic precautions are observed. A careful after-treatment, however, is necessary to keep the canal open. The reader is referred to the text-books upon gynecology for the details of the operation.

Cervical catarrh, occurring alone or with other physiological conditions of the genitals, deserves careful consideration in regard to its influence upon sterility. Radical treatment of the endometritis colli is of course more reliable than an attempt by the application of fluids, containing glycerine or tampons soaked in that liquid, to liquefy the tough cervical mucus *ante coitum,* or to remove it by means of a speculum and a camel's-hair brush. These latter may be done when treatment of the catarrh gives no results.

Ulcerations of the vaginal portion, ectropion of the mucous membrane of cervix and os, and lacerations, require appropriate treatment.

Of cervical tumors only fibroids and mucous polypi need detain us. Their treatment consists, of course, in ablation, followed by radical treatment of the diseased mucous membrane. The sessile fibro-myomatous tumors of the cervix, when large, and malignant neoplasmata of the vaginal portion, are of unfavorable prognosis as regards pregnancy, hence there need be no special treatment of sterility arising from these causes.

In cases of flexion of the uterus, the difficulty, as we have seen, lies in the marked stenosis of the internal os caused by the flexure. Treatment must be directed to raising the organ, or at all events lessening the amount of constriction. This would be best done by re-establishing the normal relative positions of the uterine body and the cervix. We may endeavor to effect it either by intra-uterine pessaries or by giving external support to the organ. The first is by far the more efficacious means, and will be considered later; the latter, in spite of all the various forms of pessaries in use, will not enable us to entirely re-establish the form of the womb. A more or less marked angle will always remain behind. Nevertheless, these means of support are of some use in the treatment of sterility, since they diminish the angle, and bring the organ at least approximately into the pelvic axis.

But direct dilatation of the stenosed parts is more trustworthy. Although the shape of the uterus is not re-established, conception is certainly rendered easier, and we see women who have long remained sterile from this cause have rapidly succeeding pregnancies after their first delivery, though the bend in the organ *post partum* is almost as great as it was at first. A similar dilatation may be attempted with instruments for the relief of sterility. That such dilatation is only temporary, is proven by the fact that women who have had flexions, and have suffered from mechanical dysmenorrhœa, often remain free from trouble for months afterwards. Such a temporary removal of the hindrance may enable the semen to reach the uterine cavity. It has been proposed to enlarge the internal os by discission, and the operation has been done; but the dangers attendant upon it are too great for it to be allowable as a remedy for sterility, and there is but little chance of maintaining the opening patent.

The dilatation may be effected in the same way as that of the stenosed cervical cavity. Rapid and forcible dilatation may be done, as Fritsch has recommended, by means of inflexible steel dilators, or Hegar's well-known dilating apparatus may be employed. With either of them dilatation should be accomplished, if possible, in one sitting. The method is the same as that employed by Simon for the female urethra. In more sensitive patients, and when the tissues are very resistant, gradual dilatation may be more advisable. I prefer, since we have mostly nulliparous women to treat, to use tents of sponge, gentian root, tupelo or laminaria; their even thickness and small calibre rapidly accomplishing our object. Hausmann's objection, that the antiseptics used may prove injurious to the spermatozoa, is not well founded, since the fluid has long disappeared before the tent is removed.

Where there has been no previous mechanical treatment, I resort to the following simple method: Lifting the body of the uterus manually or drawing down the vaginal portion with hooked forceps, if that be necessary, I introduce uterine sounds of varying size. Then I pass in Peaslee's instrument, which is constructed upon the principle of a urethral dilator, and dilate by means of the screw. This instrument is to be recommended because its upper end is so thin that it can be readily passed through the stenosed spot. A more forcible dilatation can be effected by Ellinger's instrument, or by the one which J. Schramm has recently described, and the new American trivalve instrument may be employed to complete the dilatation. If possible these instruments should be introduced daily for several weeks, and they should be used in the order named. In this simple way I have seen conception induced in a short time in repeated cases. If in spite of this the stenosis rapidly returns, I do not hesitate to employ the rather discredited intra-uterine stem, of course with the necessary precautions. I prefer those made of hard rubber, and which rest upon and are supported by a pessary. At their first introduction the patient remains in bed, and of course they are removed during menstruation. If they are well borne, they may be left *in situ* for weeks and months, even during menstruation. Their use gives us also a much more favorable version, instead of the flexion. I have not observed the ill consequences which have been described, but of course they were only left *in situ* for lengthy periods of time when careful observation and repeated examination had shown that they caused neither objective nor subjective disturbances.

Sometimes the simple introduction of the sound is sufficient to cause conception to occur, and in very sensitive individuals, or where circumstances forbid other treatment, it may be tried. It is to be introduced frequently, and finally is to be left in place daily for a short time. When anteflexion exists, and the uterus is not fixed, a cautious attempt might be made to reposit the organ with the sound.

In hopeless cases we might adopt Hausmann's plan, and push the sperma which has attained the cervical canal up into the uterine cavity with a sound-shaped instrument I do not know if any successful cases have been thus treated, but certain disadvantages attendant upon artificial impregnation are present here also.

The above treatment, of course, is only indicated in true pathological flexions, and then only in simple, non-complicated cases, which, I take it, are not so rare as is generally supposed.

From what we have said above concerning the complications of flexions, it will be seen that mechanical treatment alone is not sufficient in all cases to relieve the sterility. The almost constantly present genital catarrh, and the para- and perimetric processes must also be treated. If these appear to be the primary condition, our efforts must be principally directed against them. In fact they sometimes directly contra-indicate a mechanical treatment of the flexion, until after the other troubles are relieved, and when the sterility persists.

In cases of flexion in which all the various methods of treatment have been unsuccessful, the following process has sometimes been employed:

When, for one reason or another, the semen ejaculated into the vagina cannot reach the uterus, the surgeon may help its transfer by means of what is called artificial impregnation. Spallanzani did the operation successfully in dogs, but M. Sims was the first to try it upon the human being.

Almost all the cases of sterility due to congenital or acquired faults of vagina or cervix may be treated in this way. We need not mention them individually—they include any condition which mechanically or chemically can prevent the passage of the zoosperms. Yet it is only justifiable when all other means for the cure of the sterility have been exhausted, and both man and wife have been fully informed of the dangers of the operation, and the small prospects of its success. Properly done, it is not dangerous to life, and it may be successful. It is our last resort in otherwise hopeless cases. There are no moral reasons against it either for physician or patient, but it is a disagreeable process for all parties.

So far as our experience yet goes, its value is but small. M. Sims himself saw conception ensue but once in twenty-seven cases. Doubtless many gynecologists have followed Sims's example, but the absence of all recorded cases shows that there have been no favorable results to note. I myself have done it twice for marked anteflexion, and under very favorable external circumstances, but without success. Only in one of these cases, however, had the semen been microscopically examined beforehand. Of course the non-success is due in a number of cases to errors of diagnosis as to the cause of the sterility; the genital tract perhaps was absent above the internal os, or the fault lay in the semen itself. In one case of Fritsch's the injected mass turned out to be gonorrhœal secretion.

Very probably the want of success is due to faulty manipulation. Perhaps the semen is exposed to an improper temperature, and the syringe is not kept at blood heat, or mechanical injury is done to the delicate spermatozoa. It is possible that the genital secretions are sucked into the syringe with the semen, and exercise a deleterious influence upon it. Or the preliminary vaginal cleansing may have caused sufficient fluid to be left behind to kill the zoosperms before they have been transferred. Possibly the sperma may only retain its vitality in animal cavities, like the blood in the vessels, though the lengthy vitality of the zoosperms outside the body speaks against this hypothesis.

The possible evils are exactly the same as those liable to follow the introduction of medicaments into the uterine cavity, and have helped to discredit the operation. Perhaps the large mass of injected fluid, and the absence of the necessary antiseptic precautions, may be to blame. Fritsch's case, above-mentioned, may give us a clue to the cause of the evil results in the worst cases.

The following rules should be observed in doing the operation. The semen of earlier ejaculations must be carefully examined (see diagnosis of male sterility). Absence or paucity of zoosperms, or the presence of many dead and deformed ones, and especially the presence of pus cells, contra-indicate the operation. The vagina and cervix must be carefully cleansed, and the cleansing agent then washed away by a solution containing some substance favorable to the life of the spermatozoa (see *post*, treatment of vaginal obstacles to conception). Then cohabitation should speedily ensue, since the obnoxious secretions are rapidly reproduced. The operation should take place as soon as possible *post coitum*. The syringe must be new, and thoroughly disinfected, and before use it should be filled with the fluid used for the last vaginal washing. The ordinary Braun's uterine syringe will suffice. It must be brought exactly to the temperature of the body, and for this purpose Sims recommends that it be placed in the vagina some time before it is needed. The semen is obtained either by suction directly from the vaginal vault, or a speculum may be introduced, and the semen which collects in its gutter be employed. Courty recommends the use of a condom, so that the semen is not exposed at all to the influence of the vaginal secretions. The suction should be done very slowly, and the canula then passed immediately up to the fundus uteri. A very few drops of semen will suffice, but if antiseptic precautions have been observed even larger masses will certainly do no harm. After injection the woman should lie quiet for a time.

The operation is best done immediately after a menstrual period, or a few days before one sets in.

It is desirable for various reasons that artificial impregnation be occasionally done in suitable cases. Sterility of the male, and disease of the female genital canal above the internal os uteri, must, however, be excluded. It should be our last resort in hopeless cases.

Experiments in artificial impregnation should also be done upon mammalia, and the cause of failure in man ascertained.

Much more simple is the treatment of pure, uncomplicated versions. Here the difficulty is that the vaginal portion is not in the pelvic axis, and the external os has been displaced through the tension of the vaginal vault. We must endeavor to effect reposition, and then maintain the organ in its place, but only too often, in spite of our pessaries, it partially returns to its faulty position. But the external os is rendered freer by the support, and the access of the semen is facilitated.

Pajot recommends a more natural method. For some time *ante coitum* the fæces are to be retained in retroversions, and the urine in anteversions; and in latero-versions the woman is to lie upon the side towards which the vaginal portion tends, thus straightening out the uterus as far as possible.

Nor should we neglect the important procedure of practising cohabitation *à la vache* in marked retroversions; thus, instead of ejaculating the semen in the posterior vaginal vault remote from the os, as occurs in the dorsal position, the male urethral orifice is brought into close contact with the external os.

A. Edis recommends reposition in the knee-elbow position in these cases, the introduction of a pessary, and the practice of cohabitation in this position.

A. Sims has proposed to split the anterior lip in anteversion, and the posterior in retroversion up to the os internum, and then to carefully keep the new channel open. This method of securing free access for the semen to the womb has found but few adherents.

Descensus and prolapsus uteri rarely cause sterility; and if they do, the treatment is the ordinary palliative and curative one for these maladies.

Hernia of the uterus also need no special treatment to procure conception. Reposition, though often difficult, and sometimes impossible to effect, is the main thing.

The various uterine displacements and especially retro-position, are, as we have before said, almost invariably the result of old para- and perimetric inflammations, and these must constitute the objective points of our treatment. Here also catarrhal and exudative processes play the chief part.

We have already mentioned the important position occupied by endometritis, as a causal agent of sterility; and we include in this catarrh of the entire genital tube, from the infundibuli of the tubes to the external genitals. They must form special objects of treatment, not only when we regard them as the direct cause of the infecundity, but even when they only occur as complications of other processes, for they are frequently masked by other and more apparent disorders; while if they are cured, the obstacle to conception may either be entirely removed or at all events greatly lessened.

The more energetic treatment of endometritis which has recently become common, promises a more favorable prognosis for sterility. I have repeatedly seen women, who had been sterile for years, conceive immediately after the uterine cavity had been curetted for the relief of the hemorrhage and fluor; and so have others, and especially A. Martin. But we must be prepared for many failures, for the catarrh seldom affects the uterus alone, but involves the tubes, which are not accessible to treatment.

If endometritis is recognized as the cause of the sterility, the diseased mucosa may be destroyed, and an opportunity for its regeneration given by an energetic curetting and subsequent local treatment. I need not here go into details; but will simply state that I remove the mucous membrane with the sharp spoon, and then cauterize the surface with a 50 per cent. carbolic acid solution applied with a Braun's syringe. This injection is repeated twice more, and then for eight days more a daily injection of diluted tincture of iodine is made. Other methods may be used, but the curetting is the chief point. Simple cauterization is not sufficient.

Possibly a like treatment may be applicable to cases of membranous dysmenorrhœa, a malady so unfavorable to pregnancy, and so refractory to treatment. I know of no recorded cases, however.

As regards chronic metritis, the cause of the sterility will be found in the never-failing endometritis, and it is rational to begin with the above-mentioned treatment, though other general or local means are not excluded. Among these latter we may mention hot vaginal irrigation, massage, and the application of iodine.

The so-called acquired atrophy of the uterus will rarely be the object of treatment *quoad sterilitatem*. General roborant measures must be our chief reliance, while local remedies will only be of subsidiary benefit. The prognosis is not good, but there are cases in which conception has occurred, of which I have recorded one above. The prognosis will depend ultimately upon the condition of the ovaries; if these are also atrophic there is but little to hope from treatment.

Uterine fibromyomata, though frequently the cause of sterility, are not often treated on that account. They cause too much suffering; and in most cases they would form a serious complication in pregnancy and childbirth. Only where isolated sub-mucous fibromyomata and fibroid polypi can be easily removed *per vias naturales,* could a special treatment to permit conception to occur be entered upon. In all other cases the bad prognosis of pregnancy with these neoplasmata forbids all attempts to remedy the sterility.

Of vaginal atresias, only those in which the internal genital system is normal need be considered; and in these cases operation is undertaken not to remove sterility, but to give vent to the retained menstrual blood. It may be necessary to dilate the canal subsequently; a difficult task when it is long.

The higher grades of congenital vaginal stenoses must be treated in the manner laid down for cervical stenoses. Since the walls of the strictured vagina consist of normal tissue, they may be best dilated by means of small multi-valvular specula, thus permitting coitus to be practised.

It is much more difficult to dilate and maintain open acquired stenoses, since the tendency to recontraction is so great. Ring-shaped partial stenoses are most readily incised, and give the best prognosis.

In duplexity of the vagina the septum often interferes with cohabitation, and thus hinders conception, or the larger vagina, which receives the penis, may end above in a blind sac. In either case the septum must be incised.

If vaginal tumors, or uterine tumors which project into that canal, form obstacles to cohabitation and conception, an operation is our only resource.

The various kinds of vaginal prolapse demand reduction and retention by means of suitable pessaries.

Hindrance of conception by vaginal fistulæ can only be remedied by the closure of the abnormal opening.

Women frequently believe that the flowing out of the semen from the vagina after coitus is the cause of their sterility. In that case the woman may see to it that her hips are in an elevated position, *intra coitum,* so that the vaginal vault lies lower than the introitus. The penis should be left in the vagina for a long time *post ejaculationem,* thus helping to retain the semen until both the general muscular relaxation and the spasmodic motions of the pelvic muscles which so often expel the semen, have ceased. Crossing the legs immediately after intercourse, and remaining quietly in this position, may also help retention. The advice of the older physicians, which Eustache has recently reiterated, to push the semen further up the vagina as soon as the penis has been removed, seems very disagreeable.

Hegar and Kaltenbach advise that immediately after intercourse the abdominal wall be elevated, so as to exercise an aspirating force upon the semen.

I have already recorded a successful case in which I prevented a too free outflow by perineorraphy; and when the rupture is extensive the operation, simple and not dangerous, will be called for by other symptoms as well as by the ensuing sterility.

The unfavorable influence upon the semen of the abnormal genital secretions which collect in the vagina have already been considered. In any case of sterility a marked leucorrhœa, whether it occur alone or in connection with other diseases, must be treated. The text-books on gynecology give full particulars as to the treatment of vaginal catarrhs. Often it will be enough for us simply to minimize the vaginal secretion. The above-mentioned alkaline injections will be in place here; and while cohabitation may give no results during treatment, it possibly may immediately after its cessation. Phosphate of soda has been especially recommended by Charière. (Water thirty-two ounces, the white of one egg, and about two ounces of the drug.) Weak saccharine or glycerine solutions are said also to exercise a preservative effect upon the spermatozoa. If these injections are made immediately *ante coitum,* the injections should not be taken in the recumbent position, or the patient should stand up afterwards and exert the abdominal muscles to express any excess, for it is sufficient if the vaginal surface be simply moistened, and any great amount of fluid tends to wash away the zoosperms.

Anomalies and Diseases of the External Genitals.—Troubles of the external genitals usually hinder conception by preventing coitus or rendering it very difficult. In hermaphroditism the internal genitals are usually so abnormal that there can be no question of reproduction at all. If, however, the internal genitals are normally female, and the condition depends solely upon malformation of the external organs, simulating the male parts, operative procedure to relieve the vulvar constriction may be successful. This is also the case when there is congenital adhesion of the labia. Though the labia may be so grown together as to be almost unrecognizable, they may be separated, and by carefully suturing the edges the rima pudendi can be re-established, and cohabitation and conception rendered possible.

On the other hand, congenital adhesions of the external genitals which completely close the introitus, do not form the object of treatment for sterility, for if the internal genitals are intact, a hematokolpos forms at puberty, which demands treatment before any question of sterility can arise.

Atrophy of the external genitals, mentioned above, occurs oftenest in undersized individuals, though sometimes seen in those of large frame.

It may form an obstacle to conception from the narrowness of the vulva, although it will probably be gradually dilated by persistent attempts at cohabitation. Medical assistance may become necessary when inflammatory nervous affection sets in. Operation will be rarely necessary, but the prognosis is doubtful, for the internal genitals are usually also atrophied.

Acquired stenoses of the external genitals usually occur from diseases in childhood, and almost always necessitate operation. From the fact that we are operating upon cicatricial tissue, special care is necessary in the after-treatment to prevent renewed adhesion.

Tumors of the external genitals may be excised. If the labia are very fat, and the penis but small, we must attempt by means of dietetic measures to reduce the amount of adipose tissue.

The physician is much more frequently consulted on account of abnormalities of the hymen. This is especially the case with the newly-married, in whom the feeling of deception as regards sexual pleasures forms the first sad cloud in conjugal life, but it also occurs with older, inexperienced and bashful married people.

Complete hymeneal closure, of course, leads to hematokolpos, and demands treatment long before marriage. But there are other abnormalities of the external genitals, and especially vaginismus, which are of great practical importance.

I would recommend the following procedure in such cases: If the external genitals are normal, and no nervous symptoms are present—if the husband is healthy, and the history shows that coitus has been unsuccessful merely from lack of skill and experience—then full instructions as to the accomplishment of the act will be all that is necessary. The woman's pelvis should be elevated, and her legs widely extended, and she should carefully direct the male organ with her hand. This simple procedure is sometimes sufficient to earn the hearty thanks of a husband who has long exerted himself in vain.

If, however, in addition, the hymeneal ring is narrow, rigid, or thick, it should be dilated by the fingers, or with specula, or best with multivalve dilators. The membrane may be ruptured in our efforts, but in many cases a few bloodless dilatations will accomplish our object. Some time after the last dilatation cohabitation is to be effected as above described.

If inflammation of the external genitals is present, we should avoid all operative interference. Attempts at cohabitation should be stopped, and sitz-baths, lead-water lotions, and weak solutions of nitrate of silver, carbolic acid and sublimate be employed. Powdered iodoform I found too irritating in one case. If vaginal catarrh is present, the physician himself should make weak astringent injections by means of a canula. After the inflammation has subsided, bloodless dilatation should be undertaken.

Treatment is much more difficult when the nervous symptoms of vaginismus are present, and especially when they rest upon an hysterical basis. Dilatation must be effected after the inflammation is subdued, and in most cases this is a very difficult task. Extreme slowness and caution are necessary not to frighten the patient and render her condition worse. At the first sitting a uterine sound should be passed; at the second a catheter; at the third a fair-sized Hegar's dilating staff; and probably at the fourth the finger can be introduced without meeting too great resistance. Then dilators of increasing sizes, and finally multivalve expanding specula, may be employed. It is sometimes absolutely necessary to employ anæsthesia, especially towards the close of treatment.

Not infrequently this procedure, which is that recommended by Scanzoni, will succeed, but there are cases in which all our efforts will be in vain. In these cases, if relief is absolutely demanded, the radical procedure of M. Sims will be in place. Circular ablation of the hymen, and incision and permanent dilatation of the vaginal entrance will certainly facilitate the introduction of the membrum virile. The sensitiveness of the parts may be undiminished, but if the penis be skillfully introduced, the duration of the pain will be but slight.

Those who realize the melancholy consequences of marked vaginismus will feel more favorably inclined to the much-ridiculed method of "ethereal connection," (coitus during narcosis), which appears to have been frequently practised in America. Not only is sterility remedied, but the changes in the genitals at childbirth are such as most frequently to cure the malady itself permanently.

Pathological processes in the vicinity of the external genitals, which may interfere with cohabitation, and so cause sterility, as urethral caruncles, fissures of the anus, and coccygodynia, also need treatment.

When sterility or hindrance of cohabitation is caused by pelvic anomalies, all therapeutic measures are contra-indicated; since the pelvic deformity which must be present is such as to give a very unfavorable prognosis to any intercurrent pregnancy.

CHAPTER XXV.

THE TREATMENT OF MALE STERILITY.

JUST as the diagnosis of sterility is much more easy in the male than in the female, so is the prognosis much more clear. Treatment, however, I am afraid, is not so successful. But until we decide upon the exact share of the male in the sterility, we cannot say much upon that point. We must in the first place distinguish between true sterility and impotence.

Temporary aspermatism is of good prognosis, especially when the other bodily disturbances which may be present are of an easily remediable character. The etiology and the therapy of the condition is that of temporary psychic impotence, and will be considered under that heading.

Of much more unfavorable prognosis is permanent aspermatism; the more so the deeper seated is the malady which causes the absence of semen. Phimosis and urethral strictures give the best chances, and are to be treated surgically. If local treatment is unadvisable, or without result, and yet *post coitum* a fluid containing zoosperms exudes from the urethra when the organ is relaxed (see *ante*, etiology), the advice may be given to permit the organ to remain in the vagina *post cohabitationem* as long as possible, and so to effect a transfer, though an incomplete one, of the semen.

Much more unfavorable is the prognosis in the various diseases of the prostate, the seminal ducts, and the seminal vesicles. Not only are these organs inaccessible; the chief consideration is that we have to deal with old processes, with irreparable changes, scar tissue, etc. The prognosis depends, therefore, upon that of the original malady, and temporary improvement, such as might render conception possible in female sterility, is here useless. We refer the reader to the surgical text-books for the details of treatment.

Even more unfavorable, if possible, is the prognosis of azoospermatism. Almost all these cases occur, together with more or less impotence, and depend upon severe diseases of the testicles, or affections of the central nervous or the general system, which are incurable. And even where chronic affections of the spermatic passages, of the epididymis, vas, and cord, cause the azoospermatism, a cure is rarely to be hoped for. Thus

Liégeois reports that the spermatozoa returned in only eight out of eighty-three cases of this kind; and P. Fürbringer's statistics are even much more unfavorable. Nevertheless, we should not despair of treatment. When no local affection can be demonstrated, in the so-called idiopathic sterility, the various means to excite the activity of the testicles, massage and electricity, may be tried. Various observations show us that azoospermatism may exist for a long time; and we should only decide that the condition is a permanent one after several observations made at long intervals. The causes should be combated, bodily and mental over-exertion be avoided, the general strength supported by appropriate measures, lengthy continence enforced if there has been sexual abuse, and local maladies treated *secundum artem.*

When oligozoospermatism is present, or when we suspect that dead zoösperms, etc., cause the condition, we must search for the local causes which originate it. Failing in this we must endeavor to strengthen the constitution and seek to obtain good results in this way.

If the infecundity of the marriage depends upon male impotence, the prospects of offspring depend upon the nature of the malady that causes it. If the genital affections above mentioned can be cured or improved, the prognosis is better. Unfortunately most of the local disorders are such as render the treatment hopeless from the start.

In the same way the prognosis of impotence due to general maladies depends upon that of those disorders; and the therapy, if there is indication for any, depends upon that of the causal disease.

But the weakness dependent upon sexual excesses demands a more direct and specific treatment of impotence.

Of course there can be no question of treatment when paralysis has set in, and the sexual powers have entirely disappeared. As a rule, marriage is out of the question in such cases, but these men are married rather than marry themselves; and the physician soon finds that the wife's genitals are entirely normal, and that there is no prospect either of marital joys or children.

The matter is still worse in cases like two which I vividly recollect, where the females were young widows who had already tasted of the joys of happy marriages.

Nor are such men always quite impotent at the time that they contract marriage, but the continuous sexual excitement and the increased demands of a recent marriage are too much for them, and the remnants of potency soon disappear.

The prognosis is much better when there is only slight sexual weakness, or what is known as excitable weakness, present. Here also, however, we cannot hope for a complete *restitutio ad integrum;* caution and good management will give a sufficiently strong procreative power.

Above all things prolonged continence is necessary; for we find that excessive onanists who have mastered their vice some time before marriage, can fulfill their sexual duties satisfactorily,while those whoc ontinue their venereal excesses during their engagement, can only practise cohabitation imperfectly. If circumstances permit, the couple should be separated, and travel, residence in mountain resorts, and sea-baths alone will cure milder cases. Hydropathy and electricity have made great claims in this direction, but I must refer the reader to works upon electro-therapy, since I have had no experience myself with them.

If seminal emissions are present, they demand special treatment, especially when there is any anatomical change of the genitals.

The medicine of the past had a large number of remedies for impotence, and some of them very curious ones. Most have been thrown overboard, though a number have been retained in spite of the nihilistic tendency of therapeutics of late years. Among these are cantharides, nux, secale cornutum, and phosphorus. The reports upon them, though differing, are in general depreciatory. We are rightly reminded that some of them cause general disturbances when used for a long time; and others, like cantharides, cause local inflammations. Curschmann not incorrectly claims that any effect which they may have is only transitory, and leaves greater weakness behind. Still, a careful trial of them may be made in hopeless cases. I have myself used strychnine and arsenic, but without effect.

Kehrer has employed successfully a not ineffective method, where the seminal emission occurred too early. A speculum was introduced into the vagina, sexual excitement procured, and the ejaculated semen emptied into the instrument; conception occurred. This seems to be an excellent method of artificial impregnation, in cases where ejaculation occurs too early, or an erection cannot properly be procured. In cases where the natural vaginal friction is insufficient to cause emission, A. Peyer employs a method common with those who have formerly been onanists. Erection and orgasm is caused manually, and the glans introduced into the vagina just before ejaculation occurs. Peyer saw conception occur as a result.

Our best cases for treatment, however, are those of psychic impotence, which can be remedied by the same moral means that caused them. The most favorable cases are those in which the husband has been virtuous before marriage, and from inexperience and want of skill has been unable to attain his object *post nuptias,* and so has lost courage to renew the attempt. Here a little instruction as to the manner of accomplishing coitus, with a little encouragement, is all that is necessary. But there may also be slight obstacles on the part of the woman, and these also (see Vaginismus) should be treated. The same is true of moderate onanists, especially when they have given up the habit some time ago. But sometimes not even the most solemn assurance upon the part of the physician suffices to banish the idea that some deeper-seated lesion is present. The hypochondriacal and melancholic condition persists, or soon returns after another futile attempt. Here nothing remains but to treat the case in the way detailed for cases of irritable weakness. It is advisable not to make too favorable a prognosis in these cases, for the excitement of newly-married life may have started into activity some mental trouble, the first symptoms of which lie in the sexual sphere.

Cases of so-called relative impotence are difficult to treat; there is usually some cause for distaste, either mental or bodily, in the woman. Rosenthal reports a case where the man had to think of other women in order to provoke an erection, and it might be useful to teach the patient to do this before and during cohabitation, if possible.

Temporary impotence, on the other hand, is usually of very favorable prognosis. When the cause is removed, the evil disappears. But the proper regimen may not be always possible. And here also we should be cautious; impotence or diminished virile power is sometimes in these cases the first sign of some obscure malady.

PART II.

DEVELOPMENTAL ANOMALIES OF THE UTERUS.

CHAPTER XXVI.

GENERAL SKETCH OF UTERINE DEVELOPMENT.

A BRIEF sketch of the embryonal development of the female genitals is necessary before we begin our study of the faults of uterine growth. No attempt will be made at completeness, and a few schematic drawings only will be introduced to elucidate the text.

Our knowledge of the first development of the human uterus is imperfect. The rudiments of the sexual organs appear about the fourth week, and are alike in both sexes.

Some time after the development of the primitive kidneys, Wolffian bodies, and their excretory channels, the Wolffian ducts, there appear at the anterior and median surfaces of these organs the following two structures: 1. The sexual glands, intimately related to and developed from part of the Wolffian bodies. It is a question whether they show any differentiation into testicle and ovaries in their earliest stages. 2. The Müllerian or sexual ducts, also derived from the primitive kidneys, and first lying internal to and then behind the Wolffian canals.

These structures later become independent. They do not, however, interest us here, and we will confine our attention to the Müllerian or sexual ducts. These latter soon disappear in the male, or rather remain in their rudimentary condition, and form the vesicula prostatica or uterus masculinus; while in the female they form the excretory duct of the ovaries, and form the basis from which tubes, uterus and vagina are developed. These Müllerian ducts, far apart above, approach each other below, without uniting. (See Fig. 4.) At first blind sacs, they open later close to one another in a depression of the external surface, into which the intestinal and urinary canals also open, and which is called the cloaca. (See Fig. 5.) Still later this genital canal becomes single, and its opening lies in the sinus urogenitalis. Animal research shows us that even at the time when these sexual canals are composed merely of epithelial cells the upper part has a lumen, while the lower part is solid, and has been designated the Müllerian cord.

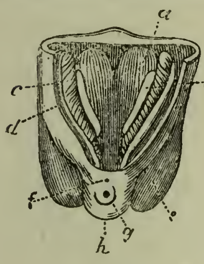

Fig. 3.

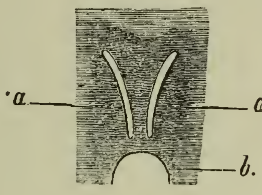

Fig. 4.

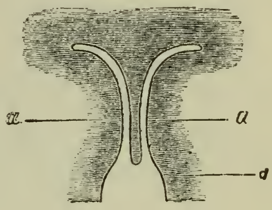

Fig. 5.

Fig. 3.—*a*, Supra-renal capsules; *b*, sexual glands; *c*, Wolffian bodies; *d*, Wolffian ducts; *f*, furrow of the urogenital canal; *g*, depression of the intestinal canal; *h*, perineum. (After *Rathke*.)
Fig. 4.—*a*, Müllerian ducts; *b*, cloaca.
Fig. 5.—*a*, Müllerian ducts; *b*, cloaca.

When the Müllerian ducts approach each other and begin to unite, they do so earlier at a point a little below their middle than either above or below, at the urogenital sinus. Finally, by the end of the second month the entire lower halves unite, but only externally; the canals are still separated from one another by a partition wall. (See Fig. 6.) By the third month this has also disappeared, and the lower halves of the Müllerian ducts then form a single canal, while the upper halves remain entirely separate. The union of the two tubes, and the disappearance of the partition extends upwards during the third and fourth months, and goes on until the lower two-thirds have united. (See Fig. 7.)

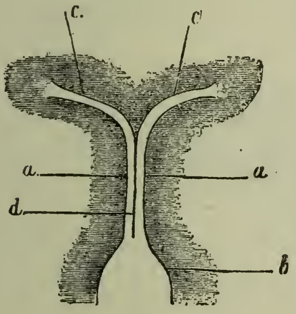

Fig. 6.

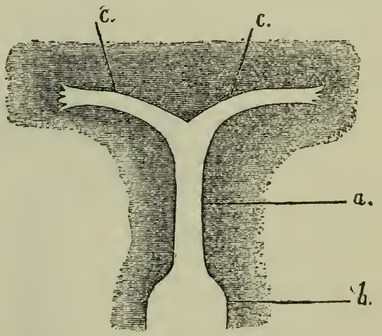

Fig. 7.

Fig. 6.—*a*, Müllerian ducts; *b*, sinus urogenitalis; *c*, tubes; *d*, partition.
Fig. 7.—*a*, United Müllerian ducts (uterus and vagina); *b*, sinus urogenitalis; *c*, tubes.

Not until the fifth month, when the union is complete, do other important changes begin, leading to the formation of the uterus and vagina out of the Müllerian ducts.

The free and non-united upper thirds of the Müllerian ducts form the oviducts. As the ovaries descend these portions assume a more and more vertical position. At the upper end a simple smooth-edged opening into the abdominal cavity is formed early, which is transformed later into the fimbriated ostium abdominale. At the point where this upper third joins the united lower two-thirds of the ducts, the round ligament is afterwards attached; and this ligament forms an important landmark in our study of the developmental imperfections of the internal genitals.

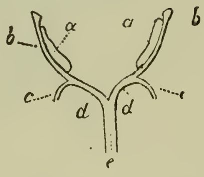

Fig. 8.

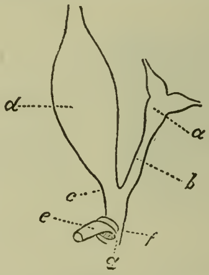

Fig. 9.

Fig. 8.—Internal Genitals of a Human Fœtus at the 8th to 9th Week. *a*, *a*, Ovaries; *b*, *b*, oviducts, *c*, *c*, round ligaments; *d*, *d*, cornua of uterus; *e*, lower part of uterus and vagina. (After *J. F. Meckel.*)

Fig. 9.—The Aditus Uro-genitalis with Vagina and Uterus of a Human Fœtus at the end of the 3d Month. *a*, Horned uterus; *b*, vagina; *c*, urethra; *d*, bladder; *e*, clitoris; *f*, labium majus; *g*, common aditus uro-genitalis. (After *J. Müller.*)

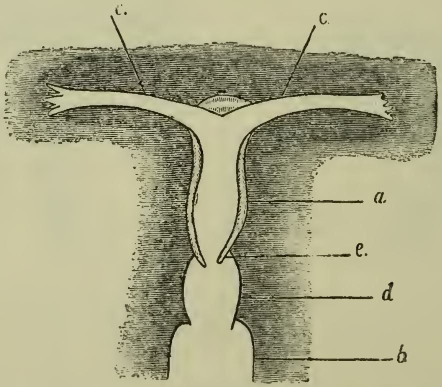

Fig. 10.—*a*, Uterus; *b*, external genitals; *c*, tubes; *d*, vagina; *e*, portio vaginalis.

Of more importance to us are the transformations which later form the uterus out of the middle third. Towards the end of the third month there appears a ring-formed projection at the place where the middle runs into the lower third of the canal; and this gradually grows inwards, and encroaches upon the lumen of the canal. In the last months of pregnancy this ring undergoes further changes and becomes the portio vaginalis and the os externum. A little later the internal os is formed in the same way, and then the walls of the canal between the two rings begin to become thicker and folded, and the cervical canal is formed. The fundus uteri is later formed by thickening of the wall between the tubes; the canal is changed into a triangular cavity, and the uterine cavity is formed.

In the meantime the lower vaginal third of the genital canal has become dilated and folded upon itself. The margins of the canal, which project first into the cloaca and then into the sinus urogenitalis, are transformed into the hymeneal ring, thenceforward forming the sharp dividing line between the external and the internal genitals.

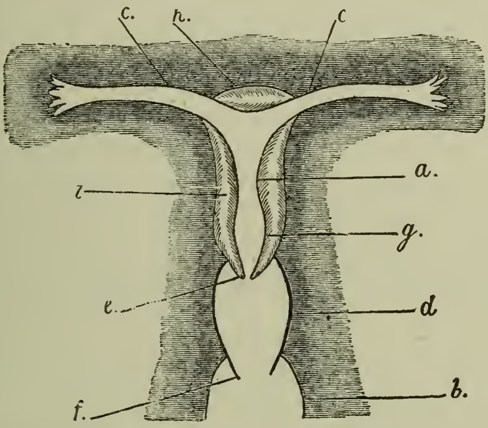

FIG. 11.—*a*, Uterine body; *b*, external genitals; *c*, tubes; *d*, vagina; *e*, portio; *f*, hymen; *g*, cervix uteri; *h*, fundus uteri; *i*, os internum.

We have seen that the middle third of the genital canal becomes changed into the uterus before the union of the two lateral halves is complete. Nevertheless, there is no trace of the division by the end of embryonal life under normal circumstances. This complete union, however, is peculiar to man and the quadrumana; in all the lower animals a greater or less division remains. Both Müllerian ducts may remain entirely separated, or, if united at their external orifices, may form two complete uteri and vaginæ. This occurs with many rodents, as in the hares. In other animals not only the vagina, but the lower part of the uterus also, is single, while the greater portion is divided into two separate horns. This is the case with the mouse. In others, as in the carnivora, there is a common uterine cavity, while the upper portion of the organ is bi-lobed. In the chiropteræ and prosomiæ the uterus is simple, but shows traces of its bi-lateral origin by two short caruna, thus forming the connecting link between the lower orders and the monkeys.

In other animals again one of the Müllerian ducts remains undeveloped or disappears, as also does the corresponding ovary. This is the case with birds.

All these modifications are of interest to us, since what we see occur regularly in the lower animals may happen as an abnormality in the human being.

The simple uterus at birth has by no means the form of the sexually mature organ. The cervix forms the chief mass, while the corpus uteri looks like a mere appendix. The cervix is not only twice as long as the body, but its walls are much thicker. The vaginal portion and the os externum are disproportionately larger, and of quite irregular figure. The plicæ of the cervical portion are continued almost to the fundus uteri, and there is no sharp dividing line between the two parts by an internal os. Not infrequently the small and thin-walled uterine body lies anteflexed upon the anterior surface of the cervix.

While all the other organs seem to develop during the period of childhood, the genitals do not. As puberty approaches there sets in not only a rapid growth, but also a change of form. The cervix does not develop as does the body of the organ. The vaginal portion becomes thinner, and the external os becomes relatively narrower, and assumes its proper round or oval form. The uterine body increases until finally it is twice as large as the cervix. Its walls become thicker than those of the latter organ, till finally the cervix appears as a mere appendage of the uterus. Gradually the folds of the uterine cavity disappear, and the developed os internum forms a sharp boundary between the uterine and the cervical canal.

These changes are not all complete by the time the menses begin; conception and birth may occur without the uterus having reached its full development. This seems to occur by about the twentieth year.

This peculiar post-fœtal uterine development is important for the understanding of certain anomalies and malformations of that organ.

For the purpose of simplifying our ideas of the origin of the various developmental faults of the uterus, L. Fürst has divided the entire period into five stages:

The first period is from the time of impregnation to the fifth week, and includes the primitive state of the organs, until the time when the changes in the sexual glands and the commencing atrophy of the Müllerian ducts in the male and the Wolffian bodies in the female show the beginnings of sexual differentiation. The atrophy of the septum which divides the adjacent Müllerian ducts has not yet occurred. There is a simple cloaca, into which the intestine and the urachus (allantois) open. At the sixth week the sexual tubercles and folds, and at the eighth week the sexual furrow, have formed, but the parts are as yet sexually indifferent.

The second period extends from the eighth to the twelfth week of fœtal life, at which latter period the septum has entirely disappeared. The point of union of the Müllerian ducts has extended upwards. The cornu of the uterus is differentiated from the tube, and the point of their union is marked by the insertion of the lig. ut. rotundum. During the second half of this period the cloaca divides by means of the formation of a septum into the anal and urogenital openings.

The third period extends from the twelfth to the twentieth week. The depression at the fundus and the uterine horns have disappeared; the arbor vitæ of the womb is formed, while the vagina is yet smooth. The orificium externum is formed. The perineum has become larger. While the vagina has increased in size, the sinus urogenitalis has remained behind, so that the bladder appears now to open into the genital canal, instead of the latter being subsidiary to it. The sinus urogenitalis has become the vestibulum vaginæ; the sexual tubercle has atrophied into the clitoris; the sexual folds have developed into the labia majora, and the internal edges of the genital furrow into the labia minora. The perineum has grown, and the hymen has been formed.

The fourth period is from the twentieth week to the end of fœtal life; and the changes occurring are not so marked as in the preceding periods. The vagina and the uterine and cervical mucous membrane become folded. The development of the vault of the fundus is characteristic of this period.

The fifth period extends from birth to puberty, and is marked by increase in the thickness of the walls of the womb. Up to the sixth year the uterine mucous membrane gradually becomes smoother and smoother, till finally only a longitudinal fold is left.

CHAPTER XXVII.

ETIOLOGY AND SYSTEMATIC ACCOUNT OF THE DEVELOPMENTAL ANOMALIES OF THE UTERUS.

THE faulty developments of the uterus, like the malformations of the external genitals, were long supposed to be accidental freaks of nature, though from the concealed location of the organ and the relative absence of symptoms, they were studied much later than most of these latter. Nevertheless they had been fairly studied at the beginning of this century; and it is not quite proper to say that we knew but little about them before the appearance of A. Kussmaul's epoch-making book. Thus in Fr. L. Meissner's text-book on Female Diseases (1842) the various forms of malformation are classified and their mode of origin described. Almost at the same time appeared W. H. Busch's great work upon the Sexual Life of the Female (Vol. III., 1841), where is to be found a fairly sufficient description of the single anomalies from a clinical standpoint. The pathologists also had done good work in this direction. Rokitansky had given an exact description of the various forms, and Förster had classified them in a very satisfactory manner. Naturally both these regarded the subject from a morphological standpoint, and a genetic classification could hardly be expected in the condition that embryology was then in. It was not until 1830 that Joh. Müller's investigations elucidated the history of uterine development, and permitted a proper explanation of the maladies in question to be given.

It was reserved for A. Kussmaul, however, to give an exhaustive description of uterine malformations, to refer their origin to interferences with the ordinary processes of development, and to classify them accordingly. This he did in his book "On the Absence, Flexion and Duplication of the Uterus," in 1859. Since his time the literature of this branch of gynecology has swollen considerably; and we may especially mention the researches of L. Fürst, V. Holst, and Le Fort. Nevertheless all that they have done is based upon Kussmaul's work.

L. Fürst deserves special credit for his efforts to fix the time at which the various malformations occur.

But although we can now decide the time and place at which the various developmental faults arise, we are yet rather in the dark as to their determining cause. Nevertheless there are certain grounds for very probable hypotheses. It is to be doubted whether anatomical investigation will suffice to elucidate the etiological relationships of these conditions. Perhaps by means of experiments, such as those to which we owe no inconsiderable light on teratology, there may in the future be more light thrown upon the subject.

But even if we do not know the ultimate cause of these faults of development, we have yet sufficient data to form some conception as to how these uterine malformations arise. The process varies in different cases.

1. The approximation and union of the two lateral organs which form the uterus may be interfered with. This union, as we have seen, begins below and extends upwards. In accordance with the time at which the interference with coalescence takes place, will be the amount of the organ in which each half is separately developed. When this interference has once taken place, the damage is irreparable, a return to the normal development is no longer possible.

2. A second factor is the disappearance of the vaginal septum formed by the union of the two median walls. Interference with this process gives us a uterus with double cavity, and since the atrophy is progressive from below upward, the division of the cavity of the womb may be complete, or it may be more or less imperfect.

3. The interference may cause nutritive disturbance in the original genital structures. Pressure from without, or inflammation, may cause changes in the shape and structure of the parts affected. If it occur early, before fusion of the lateral parts has occurred, it may affect one half only, the other side going on to develop normally. Or the interference may affect the single or yet double uterus along a horizontal plane, and the parts above and below may be quite normal. The amount of disturbance may entail complete destruction without any trace being left; or it may fall short of that. In this latter case, since the uterus is a hollow and not a solid organ, the lumen of the canal may easily be destroyed. Then are formed those important anomalies known as atresias.

4. But the obstacle to development may appear so early that it prevents the foundations of uterine structure being laid. One half only may be formed, or one segment of both sides may be wanting. In this manner also atresias may be formed, and every vestige even of a rudimentary structure be absent.

I hold that developmental faults of the uterus can only occur in these ways; but I admit that several of the above processes may be jointly concerned.

But when affected in one or more of these ways, the uterine rudiments may still increase in size, even though the normal form has been entirely lost. Thus a partitioned uterus may be as large as the regular one, and the weight of the two halves of a divided uterus may be greater than that of the single organ. And in the rudimentary uterus of an adult, the mass of tissue may exceed that of an infantile womb.

In classifying the various uterine malformations, I shall follow in all essentials the scheme of L. Fürst, which is based upon Kussmaul's work. I shall make only a few changes, the reasons for which I shall give below, and I shall omit the confusing sub-classification. For the sake of completeness, also, I shall make a few additions, and alter the nomenclature a little.

This would be my classification:

I. Complete absence of the uterus:
Defectus uteri.

II. Atrophy of the uterus:
Uterus rudimentarius.

III. Absence and atrophy of the uterine neck:
Defectus cervicis uteri et cervix uteri rudimentaria.

IV. The one-horned uterus:
Uterus unicornis.

V. The one-horned uterus with atrophied second horn:
Uterus unicornis cum cornu rudimentario.

VI. The two-horned uterus:
Uterus bicornis.

VII. The two-chambered uterus:
Uterus bilocularis.

VIII. The double uterus:
Uterus didelphys.

IX. Faulty development of the uterus:
Hypoplasia uteri.

In addition there are a number of less important uterine anomalies which cannot be easily classified under these heads.

A good deal of confusion has recently been caused by the excessive introduction of sub-divisions into this classification. A little further explanation may, therefore, be in order.

By uterus duplex I do not mean the two-horned uterus, but use the term collectively, to designate all forms of reduplication of the organ.

For the two-chambered uterus Kussmaul uses the term uterus septus. I prefer Rokitansky's old term of uterus bilocularis, as more distinctive, since septus reminds one of "septum," which is found also in the uterus bicornis. I use the word septus to designate the partition, and speak of a uterus bicornis septus when there is a septum continued downwards from the point of division of the cornua.

I call the completely divided uterus, uterus didelphys, as a shorter and better term than uterus duplex separatus. I reserve the term uterus bipartitus for the two divided and solid halves of the uterus rudimentarius. I do not follow the customary division of under-developed uteri into uterus fœtalis, infantilis, membranaceous, and small womb; since I regard them as mere anatomical varieties, and I call the whole group of undeveloped uteri hypoplasia uteri.

CHAPTER XXVIII.

COMPLETE ABSENCE OF THE UTERUS.

(*Defectus uteri.*)

IF under this designation we mean a complete absence of every trace of this organ in the pelvic cavity, the anomaly is an extremely rare one. It has been found not infrequently with extensive general malformations, acephalia, cardiac monstrosities, and others which render life impossible, but the absence of rudiments of the womb at all events is extremely rare in viable individuals or adults. The difficulties of an exact examination in these cases explain why they are so often mistaken for complete defectus. Even a *post-mortem* examination is not above cavil; the rudiments of a bi-lobed uterus have been taken for the tubes, and Kiwisch himself has mistaken the hollow rudimentary uterus for the vagina.

He had diagnosed complete absence of the uterus in a woman eighty-one years old. But the vagina consisted of two parts, a lower one, one inch long and blind, and an upper one, beginning as a pointed tube one inch above this, and measuring three inches. It was compressed antero-posteriorly and ended also in a blind sac, which was curved upon itself. The vascular bundles which took the place of the round ligament ran into the upper end of the so-called vagina. But an insertion of the round ligaments anywhere save in the uterine cornua or the tissues that replace it, is opposed entirely to the whole course of uterine development. If the uterus were absent, they would be lost in the mass of connective tissue which replaced it. (Kussmaul.)

Or there may be hermaphroditism; the vesico-rectal space is empty, and the testicles, still in the abdomen, are mistaken for the ovaries. Steglehner had such a case.

He performed an autopsy on the body of a very well-known woman, of slender and graceful person, twenty-three years old. The vulva was well developed, though scanty in hair; the nymphæ and clitoris were small, and the vagina was very narrow. Steglehner was astounded to find neither uterus, oviducts, nor ovaries; and he was about to content himself with the diagnosis " Virgo sine utero," etc., especially as the vulva was present, and she was said to have menstruated with fair regularity, when he accidentally saw something like the vas deferens ascending to the inguinal canal, and, on careful examination, discovered a testicle and epididymis.

Other anomalies are almost always present with complete absence of the uterus. Absent or rudimentary and solid tubes, atrophy or absence of the testicles, are almost always found. The vagina is nearly always involved. It may be absent or be a blind sac. The external genitals may be normal, or small and undeveloped.

If there are no tubes, then there will be no broad ligament, and the peritoneum, as in the male, passes directly from bladder to rectum. If the tubes are present, the broad ligaments appear as two lateral folds containing them, and uniting in the depth of the pelvis in a half-moon shape.

As a rule complete absence of the uterus and adnexa is only found in the above-mentioned monstrosities; in adults normal or atrophied tubes and ovaries are found. In these latter cases the external genitals are usually normal, the pelvis wide, the breasts well developed, the form and character decidedly female.

The malformation occurs during the first period: the Müllerian ducts were either not formed, or they have been completely destroyed. Both rudiments have been affected in their entirety.

The physiological importance of the anomaly, is that of the rudimentary uterus, and so are the symptoms and diagnosis. They may well be considered together below.

The best of the older recorded cases seems to me to be that of Quain, although the examination of the specimen does not seem to have been carried out with the requisite care.

An anæmic person, thirty-three years old, of female form, had had epistaxis fairly regularly every month, especially for the last two years. She would have married a man had not certain external circumstances interfered. She had undergone the ordinary changes of puberty, her breasts were well developed, and her pelvis had the female diameter. The vagina was a blind sac into which only the first phalanx of the index finger could be passed. No trace of uterus, ovaries, or tubes could be found. The peritoneum stretched directly from bladder to rectum, unless we should regard the half-moon-shaped fold at the blind end of the vagina for the rudiment of the os. The distance from the ostium urethræ to the end of the blind sac was one inch. High up on the posterior vaginal wall was a small and apparently glandular body, perhaps an ovary. External genitals were normal.

Of course there is no treatment for these anomalies.

CHAPTER XXIX.

ATROPHY OF THE UTERUS.

(*Uterus rudimentarius.*)

WE mean by this cases in which the place in the broad ligaments normally occupied by the uterus is filled by rudimentary structures, which have not gone on to develop into the normal organ. These remains vary in size and shape, according to the extent and grade of the injury, and the stage of development at which it makes itself felt. Besides this, the rudimentary structures do increase in size after the injurious influence has commenced to act.

In the highest grade of the deformity, which approaches complete defect of the uterus, and is often mistaken for it, the organ may be only indicated by a thickening of the posterior vesical wall. This is well seen in Veit's case. Or the badly developed broad ligaments themselves may be thickened in places by uterine elements, connective tissue and smooth muscular fibres. This was seen in the case of Langenbeck, of which we give a sketch.

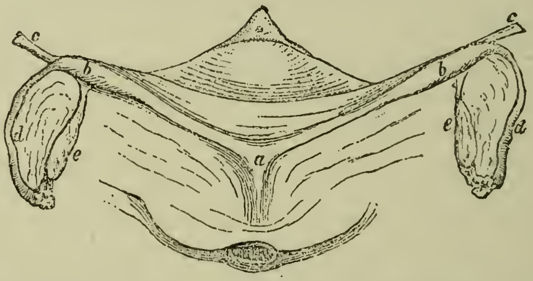

FIG. 12.—RUDIMENTARY UTERUS. *a*, United, but solid fragment of uterus; *b*, cornua of uterus; *c*, lig. rotunda; *d*, tubes; *e*, ovaries. (After *Veit.*)

In other cases the rudiment is more fully formed and appears as a smooth band, continuous above with the tubes, and below with the round ligaments. Nega has described such a case.

The ovaries were very large and long, but no Graafian vesicles could be found. The vagina was replaced by connective tissue. The labia were strongly developed, the clitoris one inch long, the pubis well provided with hair, and the mons with fat. The pelvis was masculine, though the outlet was very wide. The person was strongly built and fat, and the bosom firm. Nothing could be ascertained as regards menstruation.

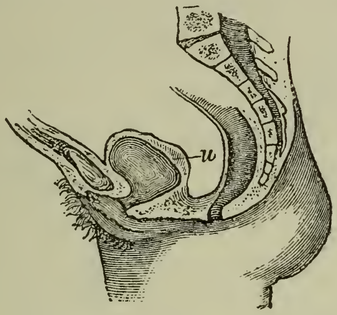

Fig. 13.—The same Uterus as in Fig. 12 in its Relations to the remaining Pelvic Organs. *u*, Rudiment of uterus.

In other cases there are two independent, solid, vertically placed bodies in the broad ligaments, forming the uterus bipartitus. Sometimes they meet and unite, and then we have the uterus rudimentarius bicornis.

In still more fully developed cases, the median piece ends in the blind vagina, and the cornua project above. This lower segment may increase in size, and more or less approach a cervix in shape; and the whole structure will then still more closely resemble a solid uterus bicornis. But in all these cases the structure is almost or entirely solid. Like the normal

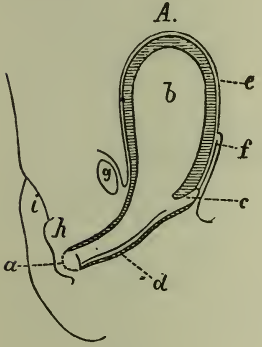

Fig. 14.

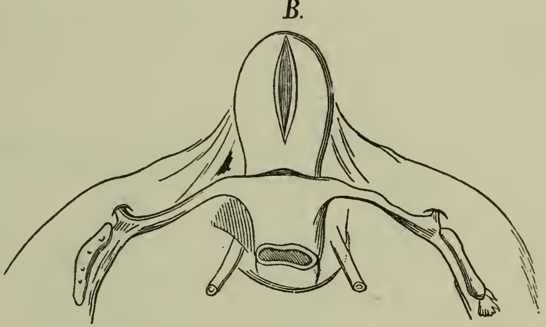

Fig. 15.

Figs. 14 and 15.—*a*, Canalis genitalis, composed here of urethra almost alone; *b*, bladder; *c*, small cul-de-sac at the upper and posterior end of the canalis uro-genitalis; *d*, delicate ridge in the uro-genital canal, being the trace of the division into urethra and vagina; *e*, peritoneal coat of bladder; *f*, section of smooth womb-like body over which the peritoneum is continued. It is united to the posterior bladder wall by loose connective tissue; *g*, symphisis oss. pubis; *h*, labium minus; *i*, lab. majus.

organ, they are composed of connective tissue and smooth muscular fibres. Although usually found in connection with other and more serious defects, this deformity does occur in viable individuals. The vagina and external genitals, and the tubes and ovaries, are usually the same as when there is complete absence of the uterus.

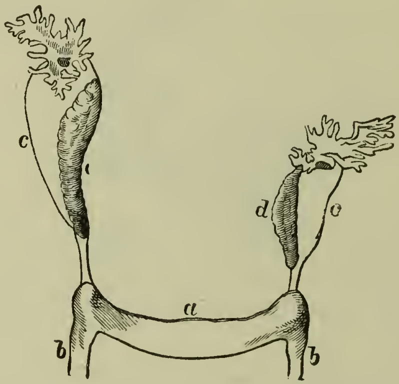

FIG. 16.—SOLID BOW-SHAPED RUDIMENT OF A UTERUS. (After *Nega.*) *a*, Band-shaped uterine rudiment; *b*, *b*, round ligaments; *c*, *c*, oviducts; *d*, *d*, ovaries.

This anomaly occurs at a time when the rudiments of both halves of the organ have been formed, but when fusion has not yet occurred. It usually involves the entire median segment of the Müllerian ducts, but it may wholly or partially involve only the lower and upper segments (vaginal or tubal). According to the intensity of the nutritive disturbance, a larger or smaller mass of the rudimentary structure is destroyed.

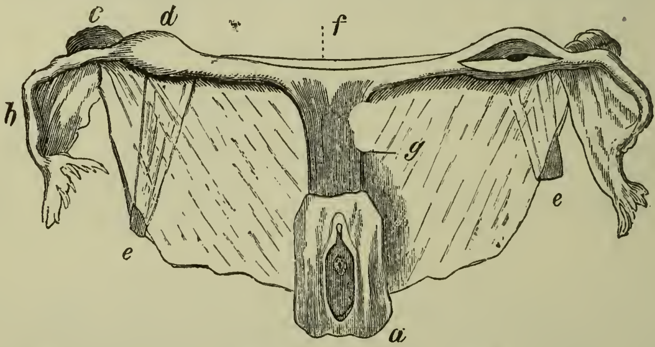

FIG. 17.—UTERUS RUD. BIPARTITUS (BETTER BICORNIS) IN A VIRGIN 60 YEARS OLD. (*Rokitansky.*) *a*, Vagina, composed of a rounded furrow about one inch deep; *b*, tubes; *c*, atrophied ovaries; *d*, swelling of the cornua; *e*, round ligaments; *f*, point of union of cornua; *g*, connective tissue with muscular fibres in it, imitating the shape of the uterine body.

As we have seen above, it makes no difference as regards the sexual function and sexual maturity whether the uterus is entirely absent or only rudimentary. The ovaries, usually present, are not infrequently normal; and the general system and that part of the genital system that is not interfered with do not suffer in their development at all. The individual remains a woman; the habitus, bones, limbs, physiognomy, and voice are female. So also is the psychic development. And so also are the pelvis, the breasts, and the external genitals.

As regards the sexual functions, there is in most cases no trace of periodic ovulation. Only in a very few instances is there a bloody flux from the remains of the internal genitals and the rudimentary vagina. But these hemorrhages are scanty and irregular, and it is doubtful whether they are menstrual in their character. They may be partly traumatic, and due to violent cohabitation when the vagina is rudimentary; this occurs in animals, and especially in cows under like circumstances. Vicarious hemorrhages, which with perfect ovaries we would expect more often, are extremely rare, though they have been observed from nose and rectum. Inflammatory products near the ovaries, and remains of hemorrhages in the abdominal and tubal cavities point to ovarian activity; but they are extremely rare. So also are the so-called menstrual molimina. We do in fact think that molimina point to functionating ovaries and ripening Graafian follicles, but whether their absence entitles us to assume the existence of an ovarian defect, our present anatomical knowledge will not enable us to decide.

There is no dispute in the vast majority of these cases as to the inclination for the other sex. Most of these women over twenty years of age were married, many of them happily. Almost all of them, whether married or not, showed distinct traces in the external genitals of the energetic attempts at cohabitation, to be more fully considered below; the pain of which would hardly have been suffered had it not been compensated by powerful voluptuous feelings.

Since the vagina usually participates in the higher grades of internal genital defects, and a canal for the reception of the male organ is not present, a substitute for it is generally found by energetic and persistent cohabitation. Either the vaginal rudiment becomes in time stretched into a very fair receptacle for the penis, or the organ wanders into the urethra, and dilates it so that a finger can readily be passed into the bladder, and, remarkable to state, without always causing insufficiency of the sphincter vesicæ. Cohabitation per anum and masturbation per urethram have been observed. We have not anatomical data sufficient to decide the important question whether sexual feeling can be present when the ovaries are entirely absent, or at least no Graafian follicles are developed. There can of course be no question of conception in any case.

It is not difficult to diagnose between a normal uterus and atrophy of the organ, but it is not easy to decide whether the organ is entirely absent or is present in a rudimentary form. We can, however, do better than former investigators, since we have in bi-manual examination and anæsthesia two powerful aids in diagnosis.

The examination is usually begun by an attempt to decide the cause of the amenorrhœa or sterility by digital exploration. Absence or rudimentary formation of the vagina can be ascertained in this way, but the finger may make the same error loci as does the penis, and enter the urethra. We must proceed as with virgins in whom vaginal examination cannot be made; we must explore the rectum. We can frequently, by bi-manual examination conducted in this way, reach an exact decision as to the shape and relations of the uterus. If bladder and rectum are empty, the pelvic contents may be pushed against the anterior pelvic wall, and easily palpated; and thus we can at once decide as to the presence or absence of the normal uterus. If now we introduce a catheter into the bladder, we can feel the entire instrument, while the presence of a normal uterus would prevent all but its lower segment being felt. If no other complications are present, this simple method will suffice to decide as to the presence or absence of a normal uterus.

It is more difficult to decide whether or not a rudimentary organ is present. Bi-manual examination under chloroform will give us a fairly good picture of the pelvic contents. If the uterine remains form sharply circumscribed masses in the broad ligaments, the differential diagnosis is easy. Thickened parts will be felt between the catheter and the finger, or in its neighborhood hard bands or masses will be felt. But these masses may be tubes or ovaries, as well as uterus. Whether it be uterine cornu or tube cannot be so easily told even at a *post-mortem* examination; and in the living subject the round ligament can not be certainly recognized, and the same is true of an unthickened and undilated tube We will not go far wrong in regarding any thick median mass as a lateral uterine rudiment. If there are two bodies on the same side, one of them is probably the ovary; the more elongated and median one being the womb, and the more external and rounded one the ovary. The peculiar unevenness, the great motility and sensibility of the organ, will also distinguish this latter. The presence of molimina will support our diagnosis. In difficult cases it may be necessary to palpate the posterior bladder wall after dilating the urethra; and this is rendered the more easy by the urethral dilatation which is generally present, and the fact that the rudimentary bodies are attached to the vesical wall.

If complications are present, a certain diagnosis will be less easy; especially when the rudimentary structures have undergone further change, perhaps have become blood tumors. Of this we will have more to say later.

I will record a typical case of the kind which I have recently had the opportunity to examine thoroughly.

Anna Barbara, of H., received in the gynecological clinic Feb. 20, 1882.

Anamnesis.—Twenty-two years old, well in childhood, has suffered from weakness and headaches since her fourth year. Has never menstruated, but since six months has had every three to four weeks cramps and backache for four to five days. Well in the intervals. Married one and one half years. Seeks assistance for the pains.

Status Præsens.—Strong, thoroughly feminine looking person of medium size. Breasts developed, pelvis female. External genitals normal, hairy, urethra not changed. Hymen present and normal. Vagina closed just behind it, but the end of the blind sac can be protruded one inch with the finger. No trace of internal genitals.

Internal Examination under Chloroform.—Rectum normal; the catheter can be easily felt through the anterior wall in the median line; at each side of this there can be plainly felt two elongated, rod-like, fairly well-marked firm bodies $\frac{4}{5}$th inch long, and $\frac{2}{5}$th inch broad. They approach one another without coalescing. To the right, about $\frac{2}{5}$ inch from the external edge of the body, is an oval mass feeling just like an ovary; and to the left can be felt a similar smaller body.

Unfortunately no information could be obtained concerning sexual inclinations. The vulva did not show signs of frequent cohabitation, and urethra and hymen were intact. The menstrual molimina pointed to functionating ovaries.

The case might be called one of uterus rudimentarius bipartitus, perhaps even bicornis.

There is of course no treatment, save perhaps for the trouble caused by the menstrual molimina in these cases. If these latter are very marked, castration may be thought of.

Thus Tauffer had a patient twenty-five years old, who had a rudimentary uterus and a vaginal atresia, but her ovaries were normal; and the trouble was so great that an operation was sought for, and successfully done. Peaslee, Langenbeck, Savage, and L. Kleinwächter report similar cases.

Still more radical measures, such as extirpation of the rudimentary uterus, may be necessary, as G. Leopold's case shows us.

The patient was twenty-eight years old, married, had vaginal atresia and defect of the uterus, and suffered from severe menstrual troubles and other nervous symptoms. Besides this there was found in the left inguinal region a hen's egg-sized tumor, supposed to be a prolapsed ovary. It was decided to remove the ovary. But when the hernial sac was opened, it was found that the tumor consisted of the left rudimentary and hollow uterine cornu, from the apex of which a tube proceeded up to a well-formed ovary. Both cornu and ovary were removed, and a perfect cure ensued.

CHAPTER XXX.

ABSENCE AND ATROPHY OF THE CERVIX UTERI.

(*Defectus cervicis uteri et cervix uteri rudimentaria.*)

BY this we mean that group of uterine anomalies which depend upon an atresia of the genital canal at the point where, under normal circumstances, the cervix uteri and the upper part of the vagina are developed. As a rule these conditions are considered in connection with acquired gynatresias, under the heading of hematometra, since the consequences and the treatment of both are very much alike. This may be practical, but it is by no means a scientific or systematic mode of treatment. The atresias belong among the uterine malformations.

As the highest grade of this kind of deformity I reckon those so-called instances of rudimentary uterus in which the membranous, hollow, and bladder-shaped womb is united to the vagina by a rudiment of a cervix. The uterus in these cases, it is true, is atrophic, but it differs from other cases of rudimentary uterus in that it possesses a cavity into which menstruation may take place, and a blood tumor collect, which is not the case with the ordinary rudimentary and solid organ. The cervix, on the other hand, is either absent, or only traces of it are visible; or, it may be present, but is solid. A small part of the vagina also may be obliterated.

And I believe, on the other hand, that many cases of vaginal atresia belong here also. We know that there is no such thing as congenital total vaginal atresia without the uterus being more or less atrophied also; and that these cases might be reckoned either as vaginal atresia or rudimentary uterus. Or, if the uterus itself is more or less normal, the cervix at all events takes part in the atresia. But there also occur cases where the vagina is only partly obliterated; where that organ forms a quite extensive blind sac, only a small part of it being closed. If hematometra occurs, there will be a more or less thick membrane between the retention tumor and the blind vagina; this membrane consisting not only of the obliterated vagina, but of the closed cervix also. For if after puncturing the tumor we dilate the artificial canal and introduce our finger, we find only an open space, and no trace of a cervical canal; the atresia has included all the tissues up to the os internum. The cavity is that of the uterus, and the closed part is composed mostly of cervix, including a part of the vaginal vault. Undoubtedly here also the chief seat of the malformation is in the cervix.

Here also belong the pure atresias of the cervix, where a portion of the cervical canal, or perhaps the os externum alone, is implicated, the part of the genital tract above (uterus) and that below (vagina) being entirely normal—cases which become typical ones of hematometra when menstruation sets in.

Here also belong those rare cases where only the os internum is closed, or where, as in Trumet's case, both ostia are closed, while the cervical canal is free.

Hence the rudimentary but hollow uteri and high-seated vaginal atresias form the most marked, while atresias of the external os form the slightest, cases of the deformity due to a rudimentary cervix.

The cervix may be entirely absent, or it may be replaced by a fibrous band, or by a solid, oval, not sharply limited thickening; or the os externum alone may be absent. The consecutive hematometra usually leads to the discovery of the anomaly, and changes the form of the cervix still more.

As regards the time of origin and the cause of these malformations there are various ideas. We may admit some disturbance of the original genital structures in cases where we find traces of rudimentary structures, and of double formations, in the unaffected portions of the genitals. But where these latter are intact and simple, it is very probable that after both Müllerian ducts have united, the lumen of the simple canal has been destroyed by nutritive disturbances, pressure, etc. It must then have occurred after the first two months of embryonal life.

The physiological importance of these anomalies depends chiefly upon whether menstruation occurs or not, and this again depends upon the condition of the ovaries. It is probably also necessary for its occurrence that the uterine cavity is so lined that it can undertake the function. Thus Kiwisch has described preparations in which there was undoubtedly a uterine cavity, but it was empty, and outside it was found the remains of a blood tumor, a hematocele.

There is another reported case, also, where the uterine body was well formed, but the cervix was closed, and mucus, not blood, collected in it. (Bryk.) This, of course, can only occur in amenorrhœic persons. The deeper-seated the atresia, and the more nearly normal the body of the womb, the more likely is hematometra to form. Of course there can be no conception, at all events until a passage is made and maintained through the closed spot. There are but few reported cases where pregnancy ensued after the operation for pure hematometra (not hematokolpos with imperforate hymen). Possibly the uterine mucous membrane undergoes such changes from the long-continued collection of blood, that adherence of the ovum cannot take place.

So that if there occur no bloody effusion into the uterine cavity, the phenomena will be simply those of a rudimentary uterus. If effusion does occur, we have sooner or later all the symptoms of hematometra.

In those cases in which the uterus itself is membranous, yet not distended with blood, the diagnosis may be made by the blind-sac ending of the vagina, and by rectal examination. Through the anterior rectal wall we can feel the regularly shaped uterine body, while the characteristic lower prolongation is entirely absent, or is only indicated by a diffuse thickening. If the cervix appears normal externally, and there is atresia of the canal, the sound will give us information. But it is usually only when hematometra forms that we are called upon to make a diagnosis. We will then find the vault of the short vagina closed by a thick, elastic, sometimes faintly fluctuating membrane, and a fluctuating tumor can be perceived per rectum.

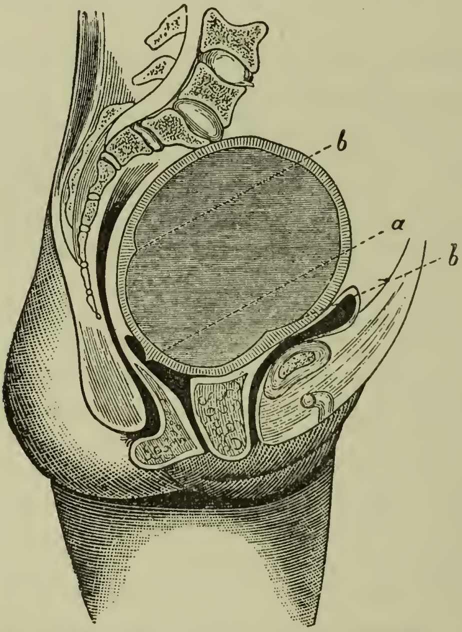

FIG. 18.—LARGE HÆMATOMETRA WITH ATRESIA OF THE OS EXTERNUM. (After *C. Schröder.*) *a*, Os externum; *b*, os internum.

If the membrane is thick, the vagina is probably also involved; if the hematometra is relatively small, and the membrane relatively thin, there is probably an atresia of the external os uteri, which may sometimes be seen as a small depression upon the surface of the occluding membrane.

Amussat and Petit have observed an exquisite case in conjunction with Boyer, Magendie, etc., which, though described as vaginal atresia, is shown by the records of the operation, and the subsequent examination by Amussat and Mme. Boivin, to have included the os uteri in the atresia.

Amussat found in a girl sixteen years old a hematometral tumor and almost complete absence of the vagina. After long consultation it was decided to make an artificial one. Amussat penetrated gradually two inches through the loose connective tissue from the rectum, and then came to a body whose size and hardness resembled that of the uterus, though there was no cervical canal. This tumor was connected with the larger abdominal one. It was pierced with a trocar, the puncture enlarged with a bistoury, and the retained blood flowed out. Amussat could not decide whether the cavity, into which he could put his finger, was the upper part of the vagina or the uterus. He found that an artificial vagina one inch long had formed, partly out of the fistulous vulvo-uterine canal. The vulva had sunk in towards the tumor, and had adhered to it; and he regarded the fistula as a utero-vaginal one. This history, together with Mme. Boivin's later examinations, justifies us in regarding the case as one of rudimentary cervix.

Specific treatment for the condition will generally only be necessary when hematometra has formed. Rectal puncture should be avoided if possible; an opening *per vias naturales* is to be preferred. If the partition is membranous, the trocar may be used; if thicker, we must employ the knife. Simple puncture and evacuation is not sufficient, since there is a strong tendency for the canal to contract. Lining the canal with mucous membrane, by uniting the vaginal and uterine mucosa, is advisable. The following case, which very probably belongs in this category, will illustrate the difficulties of these operations.

B. A., twenty years old, well developed. Since four years, abdominal cramps for four to five days every four weeks. The abdomen enlarged, but no menstruation set in. Two years ago an operation was done, after which there is said to have three times appeared a scanty menstruation. Then the cramps returned, and for their relief the patient applied to the gynecological clinic here.

Examination revealed a fist-sized, elastic, somewhat movable tumor, between navel and symphysis. Vagina was a blind sac $1\frac{1}{10}$ inches long. Bi-manual examination showed a cystic thick-walled tumor above the vagina, almost entirely filling the pelvis.

The vaginal *cul-de-sac* was opened with the knife, the finger pressed forward, and the cystic tumor punctured; a meconium-like mass was evacuated. The opening was enlarged with the knife, and the mucosa of the sac and the vagina united to one another. The sac turned out to be not the vagina, but the dilated uterus; and near the uterus lay a lax cystic body which slowly emptied its contents into that organ. It was finally concluded that there was a uterus bicornis, both horns of which were distended with blood, and that the cervix together with the upper part of the vagina had been obliterated. This diagnosis was strengthened by the results of examination a year later, when through the anterior rectal wall a body could be felt which resembled the corpus uteri in size and shape, and attached laterally to which was an egg-sized tumor. A fine sound could be passed from the vaginal blind sac into the womb. Menstruation abundant and regular. It was very probably a case of atresia utero-vaginalis.

It is a question whether an operation to open up the obliterated parts is justifiable simply to render cohabitation possible. With our present methods of treating wounds the dangers of the operation are much reduced. I think perhaps that the patient herself should decide. The operation is not hopeless, especially when we consider how often the impetus coeundi alone has sufficed to form a receptaculum penis when the genitals were lacking.

CHAPTER XXXI.

THE ONE-HORNED UTERUS.

(*Uterus unicornis.*)

THIS is an anomaly in which the uterus increases but little in size above the cervix, gradually runs to a point, and bending over to one or the other side, is almost continuous with one or other tube. It frequently occurs with other deformities, and especially with unilateral imperfection of the lower half of the body. But it has not infrequently been observed as the only deformity in otherwise well-built adults.

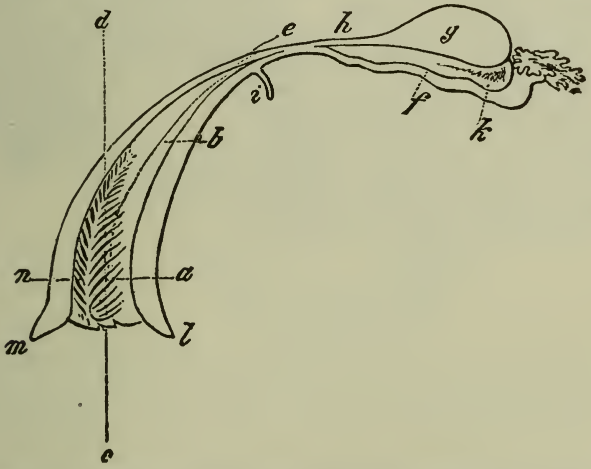

Fig. 19.—Schematic Representation of Uterus Unicornis Sinister in a Child. *a*, Cervical, *b*, corporal part, *c*, *d*, longitudinal axis of body; *e*, apex of uterus; *c*, *e*, longitudinal axis of uterus; *f*, oviduct; *g*, ovary; *h*, lig. ovarii; *i*, round ligament; *k*, parovarium; *l*, *e*, concave surface of uterus; *m*, *e*, convex surface of same; *n*, the palma plicata nearest the convex side.

The uterus unicornis is elongated, and lies bent and obliquely in the pelvis. From its apex springs a tube, an ovarian ligament with an ovary, and a round ligament. Its volume in the virgin is less than normal; and a deficient development reminding one of a fœtal uterus not infrequently accompanies the condition. The cervix is small, and the virgin vagina narrow.

On the convex side the second cornu may be entirely absent, or it may be present in an atrophied condition. If it is absent the corresponding tube ovary and round ligament are absent or atrophied (Kussmaul). In a case which Puech has described, the right ovary, oviduct, and ligament were entirely unconnected with the uterus, lay in the right lumbar region, received their blood supply from the aorta, and emptied it into the inferior cava.

The combination of congenital anomalies of the kidneys with uterus unicornis, as with uterine deformities in general, is very interesting. Absence of the kidney at the side where the uterine cornu was wanting, congenital hydronephrosis, etc., have been observed. The rudiments of both organs lie close together, and the same cause that interferes with the development of the one might hinder that of the other. Stoltz has demonstrated in the case of several new-born infants, an implication of the corresponding ureter and lateral half of the bladder in the same instances, being the highest grade of the deformity, which thus affects one entire half of the genito-urinary apparatus.

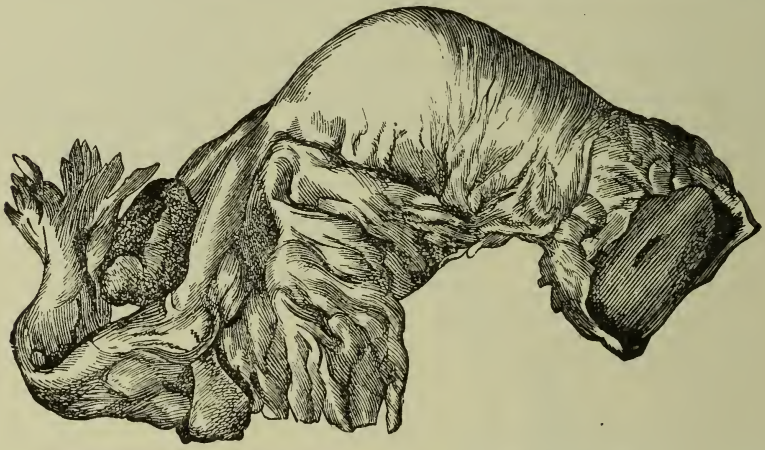

FIG. 20.—UTERUS UNICORNIS DEXTER. (After *M. Duncan.*) (Taken from the body of a woman 60 years old.)

The uterus unicornis is undoubtedly only the product of one Müllerian duct. If at the autopsy there is no trace of the other horn, the other Müllerian duct was probably never formed; if traces of it are found, the organ has been destroyed in early fœtal life.

Physiologically, the uterus unicornis behaves very much like the simple, well-formed womb. We must not forget that very probably a considerable number of these cases have been classed as cases of underdevelopment or hypoplasia uteri.

Puberty, menstruation, conception, even twin pregnancy, may occur normally in these cases. The pregnancy is not interrupted, nor does the deficient muscular development seem to tend to cause rupture during gravidity. But sometimes at birth the muscular structures are displaced by the dilated placental vessels; the resistance of the uterine wall is lessened, and, as occurred in Moldenhauer's case, rupture may occur under the influence of the pains.

In a primipara, twenty-nine years old, delivery occurred spontaneously at the end of the ninth month; the fœtus was macerated, and only one piece of the placenta could be removed. Death occurred with peritonitic symptoms after four days. The uterus was found to be slender, slightly inclined to the left. The muscular tissue was very thin, and at one point was a rupture half an inch in diameter. In the relaxed uterine cavity were portions of the placenta.

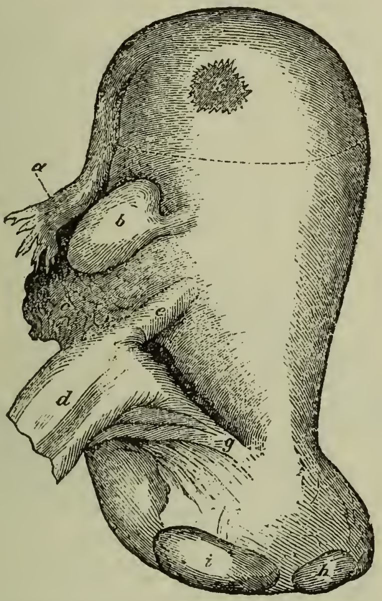

Fig. 21.—Perforated Uterus Unicornis. (After *Moldenhauer*.) *a*, Tuba sinistra; *b*, ovarium sinistrum; *c*, lig. latum; *d*, rectum; *e*, lig. utero-rectale sinistrum; *f*, cavum Douglasii; *g*, lig. utero-rectale dextrum; *h*, Uterus rudimentarius dexter; *i*, ovarium dextrum; *k*, perforation; .... boundaries of thinned portion.

Left tube and ovary were normal; the right ovary, with a solid rudiment of the right cornu, lay deep down in the true pelvis.

On account of the shape of the womb, the fœtus is always placed vertically. The obliquity of the organ might press the presenting part against the pelvic wall, but this obstacle should be easily remediable when we consider the great mobility of the organ in these cases.

The puerperium also is normal. The fact that many successive births may be entirely normal in these cases, seems to show that the hypertrophy of the first pregnancy increases the size and the resisting power of the fundus.

There are no symptoms from the deformity in the post-puerperal period, save when the womb is rudimentary also.

The non-gravid uterus unicornis will be difficult to distinguish from other uterine deformities, as uterus fœtalis and infantilis.

The smallness of the vaginal portion, the shortness of the cavum, and the thinness of its walls, may enable us to diagnosticate deficient uterine development. If now the various causes of lateral displacement of the uterus, as peri- and parametritic inflammatory exudations, tumors, etc., are absent, and the sound shows a strong deflection of the organ to one or other pelvic wall, the fundus is probably funnel-shaped. But as v. Holst has shown, only conjoined manipulation through rectum and uterus (sound) will enable us to diagnosticate the anomaly with certainty.

One would suppose that in pregnancy the condition could be more easily recognized. But lateral deflection is not uncommon at that period with the normal womb; and the condition causes so much thickening and broadening of the fundus, that the peculiar character of the uterus unicornis is quite lost. Cases are, however, known, in which the fundus does retain its form during pregnancy.

The treatment of uterus unicornis is the same as that of uterus infantilis. In either case it is questionable whether we can by therapeutic measures cause increase in the development of the organ, and so render it fit for gestation. If pregnancy is present, and the uterine walls are very thin, Moldenhauer's experience may cause us to consider the propriety of an early interruption of the pregnancy. At birth itself all the customary precautions when rupture is threatened are in order, especially early artificial delivery. Hemorrhage after delivery, from the thinness of the walls of the organ, should also be looked out for.

CHAPTER XXXII.

ONE-HORNED UTERUS WITH ATROPHIED HORN.

(*Uterus unicornis cum cornu rudimentario.*)

HERE the convex side of the uterus unicornis has a structure attached to it, which corresponds to a more or less developed second half of the organ. The developed part of the womb is exactly as has been described in the last chapter.

The body in question may be small, round, and solid; and it can be unconnected with the uterus and the ovary of that side (save for the peritoneal fold); showing that the Müllerian duct has atrophied at both ends. Or it may appear as a thin, band-like muscular streak. Or again, it may form a flattened solid muscular beam with thickened end, or perhaps it terminates in a hollow body, which communicates with a tube and is provided with a round ligament and an ovary.

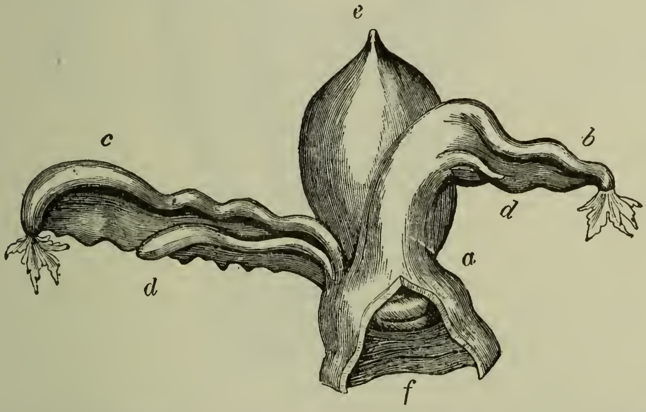

FIG. 22.—UTERUS UNICORNIS OF A CHILD. (After *Pole.*) *a*, Right cornu, left being undeveloped; *b*, right oviduct; *c*, left oviduct; *d*, *d*, ovaries; *e*, bladder; *f*, vagina, into which the orificium urethræ projects.

The size of the mass representing the second cornu varies greatly in different cases, as does also its development into a uterus-like organ, so that we find all manner of transition stages between uterus unicornis simplex and uterus bicornis.

The fleshy band which connects the second horn with the unicorned uterus sometimes contains a canal, which may be blind at both ends, or may connect the two cavities. But in some cases the band possesses no demonstrable canal, even on the closest examination; and this in cases where pregnancy of the rudimentary cornu has occurred.

The sexual functions are the same as in uterus unicornis, if the rudimentary horn is solid. A mechanical obstacle only can be present at birth. But if the atrophied half contain a cavity, menstruation and gravidity may occur in it, and the anomaly may be of the gravest importance.

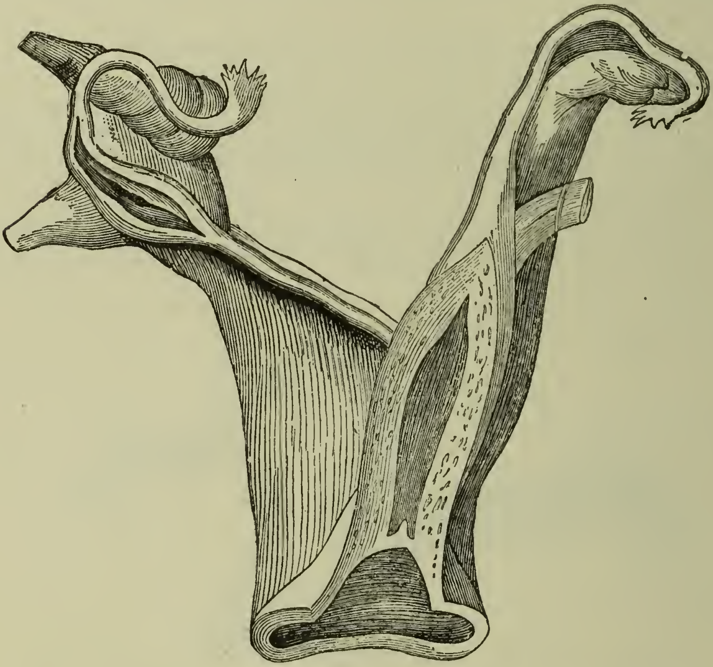

FIG. 23.—UTERUS UNICORNIS, WITH ATROPHIED SECOND CORNU. (After *Rokitansky*.)

We do not know how frequently the rudimentary cornu participates in menstruation. The cases in which the rudimentary horn is closed, and where hematometra would occur if menstruation did, would tend to show that the function is not usually participated in. There are only a few cases of the kind, which have been observed by Hegar and Frankenhaüser. Probably the fully developed portion takes upon itself the function; and even when the rudimentary horn does so, the effusion of blood occurs but very late. The amount of fluid also is relatively small, so that, as compared with hematometra of the developed uterus, a long time is needed before the tumor attains any considerable size. There are the same local troubles and neighboring changes, and the same effects upon the general system as occur in hematometra of the simple organ. Hematosalpinx may occur while the blood-tumor is yet comparatively small. Rupture of the small blood-sac has not as yet been observed. It is worth noticing that Frankenhaüser has shown that hematometra of the subsidiary cornu may occur even when the connecting band has a patent channel through it; pressure upon the blood-tumor causing hemorrhage from the cervix with shrinkage of the tumor.

If there is no menstruation, hematometra may set in; and even when there is a regular bloody flux from the normal side, the rudimentary one may be swollen by masses of mucus. And without any demonstrable cause, and with but few general symptoms, pyometra of such sacs may occur.

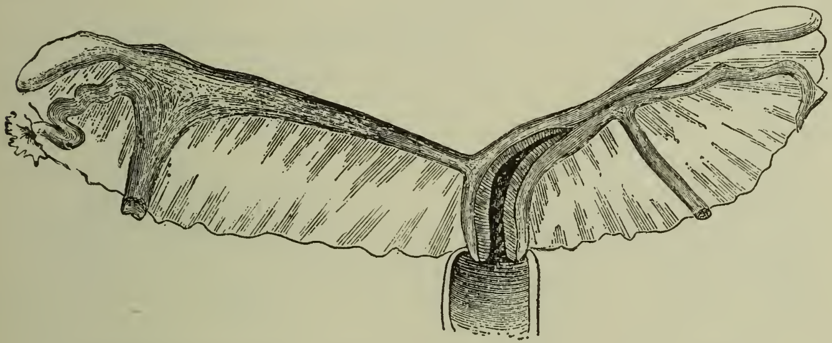

FIG. 24.—UTERUS UNICORNIS, WITH ATROPHIED SECOND CORNU. (After *C. Schröder.*)

Frankenhaüser has observed a case that is of diagnostic interest. The tube, the atrophic subsidiary cornu, and a vaginal rudiment were all distended; the purulent contents broke through into the rectum. After repeated incisions and injections a cure was effected, though a fistula was left behind.

Conception may occur, and normal uterine growth take place in the developed cavity, and a few cases are recorded where every ovum developed in this side, and pregnancy and childbirth were quite normal.

But even in these cases the rudimentary horn may interfere with delivery when it is low down and swollen, and is driven into the pelvic canal before the advancing part. This the following case will show:

A woman who had menstruated regularly, and had before miscarried at six and four months, at the end of her third normal pregnancy had the pelvic canal half filled by an apple-sized tumor, alongside of which the head endeavored to pass. The tumor was supposed to be a fibromyoma, and perforation and cephalotripsy were performed.

At her next delivery I was absent, and the infant was born feet first, but the head could not be delivered, and the child died.

At her next labor the position of head and tumor was the same as in the former one, but at the vaginal vault a partition was visible, which had been overlooked at previous labors. Bipolar version was performed and the feet brought down, but the child was dead. The tumor was then more carefully examined, and a diagnosis of a rudimentary and prolapsed subsidiary cornu made; and this was confirmed by two later examinations.

Borinski observed a similar case later, and his diagnosis was proved correct by autopsy.

Both my own case and that of Borinski show that in one and the same woman the pelvic canal may be clear in one labor and blocked in another by the displaced and fixed immature cornu.

But these cases are rare, only the two above recited are known to me. As a rule, the delivery is entirely normal.

But the case is quite different when pregnancy occurs in the atrophic horn, perhaps after births have occurred regularly from the normal half of the uterus. The implantation of the ovum in the rudimentary cornu may occur in several ways.

If the channel between the normal and atrophic halves of the uterus is open, the spermatozoa may penetrate the latter cavity, and encounter there an ovum coming from the ovary of the corresponding side. Or the ovum may originate in the ovary of the normal side (as has been proved by the corpus luteum at autopsies), is impregnated, and travels through the abdominal cavity to the other side, a process which has been called transmigratio ovuli externa. Of course it is not impossible that the ovum may go the other way round, through the connecting band,—transmigratio ovuli interna. Cases of tubal pregnancy, where the abdominal end of the tube is closed, are analogous, and have been explained in a similar way, but it does not seem a very probable explanation, and we should not forget that the closure may have occurred after the ovum reached the tube.

If, however, the uniting band is solid, fructification may occur in either of the following ways: The ovum of the sound side is impregnated, and wanders over to the atrophied womb cavity (again transmigratio ovuli externa), or the semen must pass through the normal uterus and its tube, and reach the ovum in the rudimentary cornu (transmigratio seminis interna). The number of the zoosperms, and their active motion,—and they have been found in the abdominal cavity of animals far from the ostia of the tubes,—renders this latter the more conceivable mode; for the ovum is single, and must be moved by external force.

The ovum once being implanted in the rudimentary cornu, it developes to a certain extent; while the normal cornu enlarges, and a decidua forms in it, exactly as occurs in extra-uterine pregnancy. But the muscular structure of the atrophic horn is so weak that its hypertrophy cannot keep pace with the growth of the ovum; and after a certain time, usually between the second and fifth month, spontaneous rupture occurs at the thinnest place. Most often rapid internal hemorrhage, less frequently a fatal peritonitis, terminates the process. I know of only three cases where the fœtus was borne to the end of pregnancy. The first is one of W. Turner's.

A woman thirty-eight years old was at term. Pains were severe; fœtal pulse and motion distinct. Vagina and vaginal portion simple; uterus empty; tumor to the left; after three days pains ceased. The woman died of phthisis six months later. The autopsy showed only a right and curved cornu connected with the vagina. From the cervix a ligament proceeded to the left, solid, and composed of muscular fibres and vessels. Its further end was attached to an extensive cavity twenty-five inches in its largest diameter, in which was the fœtus. Tubes and ovaries were normal.

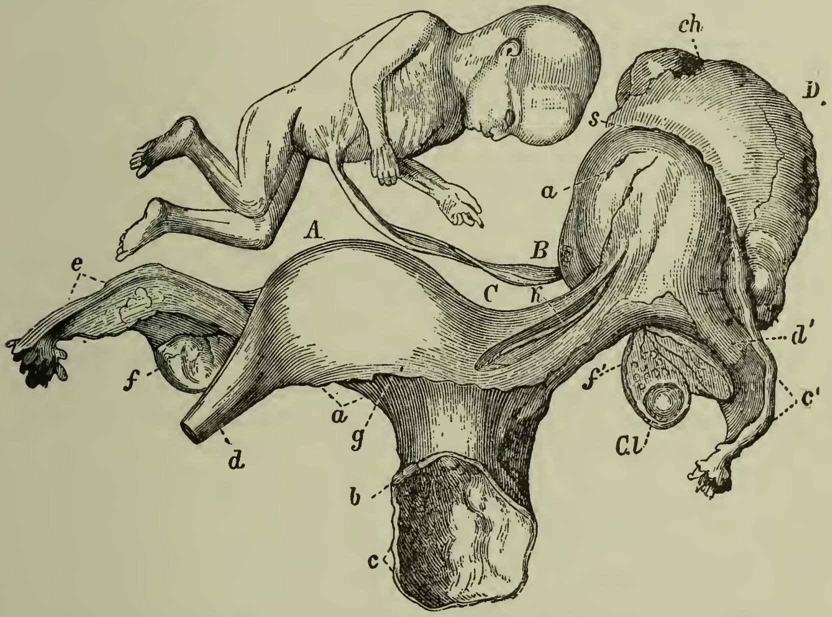

FIG. 25.—*A*, Right developed cornu; *a*, body of same; *b*, vaginal portion and external os; *c*, vagina; *d*, round lig.; *e*, tube; *f*, ovary; *g*, edge of divided serosa; *B*, left rudimentary cornu; *a'*, body of same; *d'*, round ligament; *c'*, tube; *f*, ovary (its ligament is marked by punctate line); *cl*, corpus luteum; *C*, connecting band; *k*, canal; *D*, placenta; *s*, furrow between *B* and *D*; *t*, contour of border of subsidiary cornu; *ch*, portion of chorion with hæmorrhagic infarction and probable seat of rupture. (After *Jaensch.*)

The two other cases of M. Salin and Litzmann will be described later under the treatment.

In very rare cases rupture does not occur; and inflammation and suppuration of the sac, with its subsequent changes, occur exactly as in the case of all extra-uterine pregnancy.

One of the most interesting of the older recorded cases is that of Pfeffinger and Fritze. The fœtus died at the fifth month, became dessicated, and partly calcified. More than thirty years later suppuration set in, perhaps, as Kussmaul supposes, because the gradual shrinkage so exposed the bones that they finally proved sources of irritation, and caused suppuration.

A woman was condemned to prison for life by the Strasburg authorities for some crime committed in youth. As she claimed pregnancy, had no menses, and vomited, she was left in the hospital under constant guard. Then, as a master of midwifery could detect no signs of pregnancy, she was taken to the prison. Here her vomiting was such that she could neither do any hard work, nor eat any but light foods. Thus she lived for thirty odd years Finally she began to have pains in the lower abdomen; fever set in; she rapidly emaciated, and died after four months.

The body was examined in the anatomical theatre by Prof. Pfeffinger. He found a large hernia at the lesser curvature of the stomach, in which seven cooked beans had been impacted for two months, and at the middle of the left Fallopian tube was a hard ball three inches in diameter. Its surface was skin-like, and showed various-sized bony spots. When cut into, frightfully foul-smelling pus escaped, and fœtal bones were extracted with the forceps.

Seventeen years later Pfeffinger gave Fritze the alcoholic preparation for a more detailed description. He also considered the case one of tubal pregnancy, but since he states that the left round ligament was attached to the fœtal sac, and not at the point in the uterus fixed for that purpose by the Creator, it was undoubtedly a case of pregnancy in a rudimentary uterine cornu.

Rupture of the sac is necessarily fatal; encapsulation, as in Chiari's case, may occur.

He found a uterus unicornis with rudimentary cornu at the autopsy of a woman sixty years old. On the posterior surface of the atrophic cornu he found a stellate cicatrix; and in Douglas's *cul-de-sac* lay the shrunken body of a four months' fœtus, the bones of which were covered with thick bands of connective tissue, in which were calcareous plates and masses of brown pigment.

But, as in extra-uterine cases, laparotomy or Cæsarean section may become necessary, as in Koeberle's interesting case.

In a woman of twenty-nine, married nine years, fœtal movements ceased at the seventh month. After a month, the pains returned; after six months the cervix was found hard, conical, and turned to the right. The sound entered 2.4 inches to the left in an empty uterine cavity; and to the right a pregnant uterus could be felt. Puncture of tumor, and evacuation of a bloody-purulent ovarian fluid. Three months later, weakness and collapse. Sectio Cæsarea; removal piecemeal from the right uterus of a fœtus. Placenta five days later. Recovery.

In all cases upon which no autopsy was made, there remains the doubt whether extra-uterine and especially tubal pregnancy was not present. For it cannot be decided during life, probably even if laparotomy is performed, whether the tumor lies median to the round ligament or not.

The malformation originates of course at the time when the two Müllerian ducts have coalesced as far as the os internum. The remnant may entirely disappear, or it may remain, more or less atrophied, and with or without a cavity.

Diagnosis.—We must first demonstrate the existence of the developed half of the organ as a one-horned uterus, as in uterus unicornis. For the recognition of the rudimentary cornu we must find that a cord proceeds from the convex surface of the womb, to which is attached an oval, nut-sized body. If there is no cord, but only a band-like mass, the diagnosis will be more difficult.

In some cases it will be possible to recognize a cord an inch or more in length, springing from the external surface of this body, and going laterally. This is the tube; and the body must be a portion of the uterus. Unfortunately we are rarely able to feel the tube with the necessary distinctness.

Mistakes may occur in more than one way. A pedunculated fibromyoma springing from the side of the uterus may be mistaken for a rudimentary cornu. But its sharp borders and its usually intimate connection with the edge of the uterus speaks for fibromyoma; and the uterine body itself will be found to be normal.

If the band of union is a long one, the uterine rudiment may be mistaken for the corresponding ovary, but the discovery of a second lateral body will settle that

How easily one may be mistaken during pregnancy in the developed half, is shown by the fact that in the case above-mentioned I considered the tumor to be a fibromyoma, and Frankenhaüser under similar circumstances considered it to be an ovarian tumor. But after delivery the diagnosis is easier; if the tumor rapidly gets smaller it can only consist of the uterus.

If we find a more or less perfect vaginal partition present, our attention will at once be directed to duplexity of the uterus, and our diagnosis enlightened.

As in uterus unicornis, rectal examination may be of great value when the vagina is narrow.

But a decision is by no means easy when hematometra developes in the subsidiary cornu. There will, it is true, be severe menstrual troubles and sudden increase of size of the sensitive tumor, but the effusion is rarely great enough to render the elasticity or fluctuation of the tumor of much use to us. Nor does the effusion occur as regularly as in the normal uterus. Hegar, to whom we are chiefly indebted for our knowledge of hematometra of the rudimentary cornu, admits that he first reached a diagnosis by a process of exclusion.

Perhaps we may be aided by the fact that in hematometra of an atresiad half of the uterus tubal blood-sacs are readily formed. If a second elongated tumor projects upward from the blood-sac, the hematosalpinx will point to the correct diagnosis.

If the patient's condition demands relief, and if a diagnosis must be made, puncture of the tumor from the vagina should be undertaken. A brownish bloody fluid will issue if hematometra is present.

Nor is the diagnosis easy if gravidity occurs in the atrophied half. We will recognize the existence of pregnancy by the objective and the subjective symptoms, and by the enlargement of the real uterus; and the steady increase in size of the extra-uterine tumor will point to a gravidity at some improper place. But it will be almost impossible to say whether the ovum is located in a tube or in the rudimentary cornu, since we will not be able to feel the ligamentum rotundum with certainty.

There can be no question of treatment while the genital functions are normal. But if the menstrual blood begins to accumulate, we must decide whether an active course or expectant treatment is to be followed. If the tumor grows but slowly, and causes no serious local and general disturbances, we must decide for the latter course. But if the tumor grows rapidly, and rupture threatens; or if peritonitic symptoms appear, or the general health suffers, an operation must be undertaken. Simple puncture is only palliative; and, if immediately necessary, should be done through the vaginal vault, and not per rectum. Nor is such a puncture free from danger. We cannot readily penetrate the layers of the broad ligaments, and reach the sac without injuring neighboring organs and large vessels, or piercing the peritoneum twice. Therefore Hegar recommends that when immediate evacuation is not imperative, inflammatory action by means of caustic pastes, etc., should be brought about, so as to cause intimate adhesion with the vaginal vault or the anterior abdominal wall. The sac may then be punctured, and the puncture dilated. Here also I believe it would be well to cover the canal by uniting the mucosa of the sac with that of the vaginal vault, or with the external integument.

Nevertheless this process is uncertain and difficult, and it is a question whether laparotomy is not to be preferred in serious cases. The unopened sac may be stitched to the abdominal wound, and then opened; or the entire sac may be extirpated. Our choice will depend largely upon the motility of the tumor. If it is more or less fixed, suture to the external surface is better; if it is very movable, extirpation is to be preferred.

Thus F. Howitz had an amenorrhoic girl eighteen years old, with a tumor that reached above the navel. The description shows that it was the anterior right uterine cornu. The tumor being found adherent, it was stitched to the abdominal wound, and then treated with the thermo-cautery and chloride of zinc. Violent fever set in; incision was done on the third day, and fœtid gas and stinking pus evacuated. Drainage and injections effected a cure.

It is a question whether simple castration will not suffice in cases where extirpation or suture of the sac is too difficult or too dangerous. Though the blood-tumor is not removed, its increase is provided against. Resorption might occur. But we know but little of the changes that stationary hematomata undergo.

If the rudimentary cornu forms an obstacle to delivery, it is to be treated as a tumor that narrows the pelvic canal. Manual reposition, if necessary, in side or knee-elbow position, must be tried first. If that does not succeed, operation is indicated.

In a case of Frankenhäuser's the small seven months' fœtus glided by the tumor without reposition. Borinski had a breech case of the kind, and had to perform cephalotripsy before he could extract the head; and, as before stated, I had to perforate and do cephalotripsy once, and later to turn by the feet.

If gravidity occurs in the rudimentary horn, we must proceed exactly as in extra-uterine pregnancy, from which the condition cannot be distinguished.

If we decide upon laparatomy, we must use the same operative measures as for hematometra of the rudimentary cornu. We need not nowadays recoil before the dilated vessels which we will encounter in the uniting canal.

M. Salin has published an extremely interesting case of the kind:

In a twenty-two year old primipara, labor did not set in at the usual time, and the fœtal movements ceased. For six months thereafter she had hemorrhages and bearing-down pains. The uterus went down, but the fever and emaciation increased; and, though the diagnosis was uncertain, laparotomy was decided on. The tumor was movable, and was attached by a broad pedicle to the supra-vaginal portion of the cervix. Adhesions, and a perforation of the sac were found. The latter was dilated, the fœtus extracted, the pedicle tied, and the uterus ablated. The patient recovered.

The solid pedicle was connected with the other half of the uterus, and the movability of the tumor bespoke a gravidity of the rudimentary cornu, caused by transmigration of the zoosperms.

Litzmann's case was similar.

The diagnosis was that there was a decomposing fœtus in the womb. Laparotomy for its removal was decided on, on account of the increasing purulent outflow and the loss of health. The uterus was dragged out of the abdominal incision, and its lower segment tied and the sac removed. The woman died two days later. The autopsy showed that the full-term fœtus had been in one horn of a uterus bicornis, the cavities of which did not communicate with one another.

Sänger reports a similar case: A peasant woman, twenty-one years old, the mother of two children, had the cornu of a seven months' uterus removed nine weeks after the death of the fœtus. The stump was sutured, tied with an elastic ligature, and replaced. She soon conceived again.

These cases are interesting as showing that the fœtus may go to term in an atrophied subsidiary cornu; and that Porro's operation for uterine extirpation is thoroughly justifiable in them.

CHAPTER XXXIII.

THE TWO-HORNED UTERUS.

(*Uterus bicornis.*)

HERE the uterus forms a single mass in its lower section, but divides above into two portions which project at a more or less obtuse angle on either side, and each of which possesses its own separate cavity.

The amount of division apparent externally varies greatly. In the highest degree of the deformity, the bodies are entirely divided, and seem to be only placed in apposition; and the common cervix has a deep furrow upon both its anterior and posterior surface. In lesser degrees the cervix appears single, but is exceptionally broad; and in a still less degree the division of the uterine body is marked externally only by a furrow in the broadened fundus, forming the important form of the malady known as uterus arcuatus. In the very least marked degree the fundus, instead of being arched, is flat; and the division is apparent only inter-

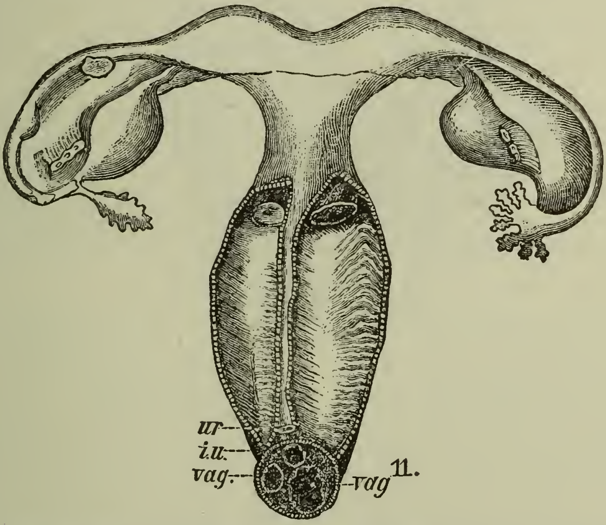

FIG. 26.—UTERUS BICORNIS. (After *Hunkemöller.*) *ur*, Divided urethra; *i.u*, introitus urethræ; *vag.* and *vag.''*, entrance to the two vaginæ. The anterior wall of both vaginæ is removed.

nally. Thus we get the triangular or anvil-shaped womb; uterus triangularis or incudiformis.

As a rule, the left horn is turned anteriorly, and the right horn more to the rear. This twisting of the organ upon its longitudinal axis is what is seen in the normal womb also, and is probably due to the presence of the rectum.

As a rule there exists a partition wall inside the uterus. The uterus and cervix may be completely divided into two separate compartments (uterus bicornis septus), and the dividing membrane may partly or wholly involve the vagina also. In other cases the body of the womb only is partitioned, and the cervix is single (uterus bicornis unicollis). Or the partition wall may only partly divide the uterine cavity itself, while the two cornua are completely separated (uterus bicornis unicorporeus). Or again, the partition of the uterine body may be only indicated by a prominent ridge upon the posterior uterine wall.

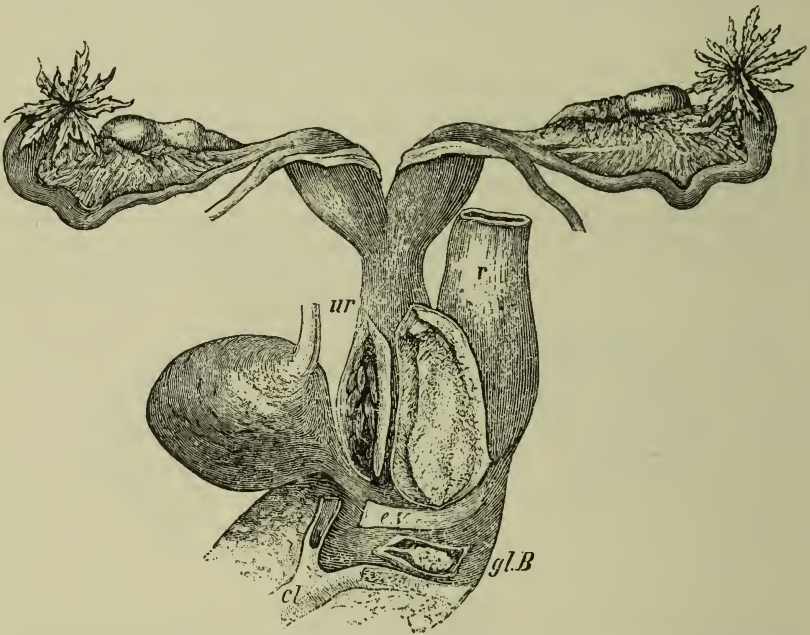

FIG. 27.—UTERUS BICORNIS. (After *Delle Chiaie.*) *r*, Rectum; *ur*, single ureter; *c.v*, constrictor vaginæ; *gl.B*, glandula Bartholini; *cl*, clitoris. Both vaginæ are laid open.

The two halves of the womb are rarely equally developed; one is usually larger than the other. Transition forms, between the complete uterus bicornis with both halves fully developed and the uterus unicornis with rudimentary cornu, are frequently observed.

The ligamentous band, so frequently found between the posterior vesical and anterior rectal wall, and traversing the furrow between the two uterine cornua, the ligamentum recto-vesicale, is of importance both in relation to the origin of the anomaly and in connection with pregnancy.

As regards neighboring organs, the tubes and ovaries are usually normal, but the vagina often participates in the duplexity. The vagina may be double; and one vagina will then usually be found to be less developed, narrower, or blind at its upper or lower end. Often the dividing membrane does not extend down to the introitus, or the two vaginæ may communicate with one another by orifices in the partition.

The external genitals and breasts are usually normal.

The atresias which may affect one half of a uterus bicornis, and which may be at the cervix or at the os externum, are of great importance. If the vagina participates in the reduplication, the division may extend even down to the hymeneal region. The less developed side is almost always closed.

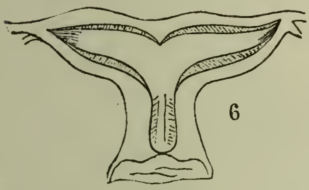

Fig. 28.

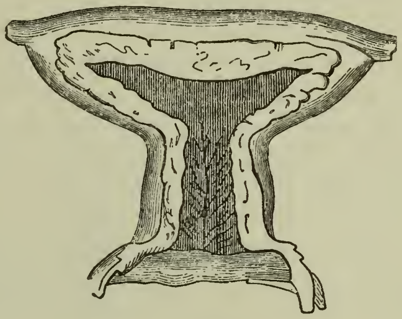

Fig. 29.

Fig. 28.—Uterus Bicornis Unicollis, (Uterus Arcuatus). (After *Förster*.)

Fig. 29.—Uterus Incudiformis from a Girl 17 years old, dead of Phthisis. Oviducts and ovaries were vell developed, and the Graafian follicles were large and numerous. Vagina wide and well formed. (After *Oldham*.)

It is interesting to note that the symptoms of duplexity sometimes extend to the rest of the body; the transverse diameter of the pelvis is increased, and the face and thorax is broadened. The general female character of the entire organism is, however, in no way affected.

The sexual functions are, however, disturbed. Menstruation is irregular. When the partition is complete, it does not always occur simultaneously from both cavities; or the two halves may alternately functionate. If other menstrual disturbances are present, they are usually referable to other causes.

When one half becomes pregnant, menstruation usually ceases entirely, but there are cases in which the menses appear regularly from one half, while the other half is in a gravid condition. The following carefully reported case of Francis Henderson is interesting in this connection:

Henderson watched this patient for seventeen years, and his observations are, therefore, thoroughly reliable. The patient was thirty-nine years old, had menstruated from her sixteenth year regularly every three weeks for eight days, until six weeks previous to the birth of her first child, which occurred one year after her marriage in 1866. This birth, and the other five were normal. All the children were nursed by her; and the menses were absent during lactation.

During the first gravidity the menses were more abundant than usual; during the second there was an almost constant bloody flux, which became profuse at the slightest exertion; and the patient was very anæmic when she bore a child in 1868. The menses appeared three times during the first gravidity, the fourth, fifth, and sixth gravidities and deliveries were entirely normal.

After weaning the sixth child she menstruated regularly until June, 1879. Then the menses were absent twice, and the patient believed herself pregnant. Thereupon there ensued a continuous moderate hemorrhage until December of the same year. At that time Henderson believed abortion to be unavoidable, and dilated with laminaria. One inch above the os externum he found a septum, which divided the womb into two cavities. The left cavity, one inch long, was entirely empty; and from the right cavity, 3½ inches long, only a small amount of white, fibrous matter could be scraped out. After this the uterus returned to its normal size. Henderson himself inspected all the matters that were brought away, and there were no fœtal remnants. He, therefore, thought that there probably was an extra-uterine pregnancy. Menstruation thereupon set in as before until gravidity again began, and the seventh birth occurred in October, 1882. Henderson did not have an opportunity to decide which part contained the ovum, but one month *post partum* the left portion was found by the examining physician to be the most developed.

Bilateral atresia of the uterus bicornis has not yet been observed. Most often the right half is occluded, and hematometra occurs in it as in the rudimentary uterine cornu. There are some cases, however, where years may pass after puberty, without the first symptoms of blood stasis setting in. And the growth of the tumor may be so slow that it may finally only reach very moderate dimensions. This irregularity is due to the fact that the entire development of the individual is delayed, or the closed cornu is only in a rudimentary condition.

Hematosalpinx not infrequently appears early; and it is liable to rupture earlier than is the dilated half of the uterus. Adhesion of the womb to the abdominal wall from peritonitis, and external rupture of the sac has also been observed.

Perforation into the patent uterus or into the vagina is much more favorable, and definite cure may occur from the fistula remaining open.

But not infrequently the catarrh of the patent canal spreads to the former closed cavity, in which there is frequently some blood stagnating, and suppuration sets in. If the opening now closes we again have a tumor (pyometra lateralis). And besides this, suppuration may occur from unknown causes in a sac filled with blood or mucus. The sac may break again into the sound half, or the pus may be evacuated through the tubes into the abdominal cavity.

Lobonowski has recorded a case in which mucus collected in the imperforate half. Here there can be no menstrual flux, but only a condition of hypersecretion of the mucous membrane. These tumors do not become very large.

Menstruation gives us peculiar symptoms when one half of a bicorned uterus is imperforate and distended. Menses are present, and yet the symptoms of hematometra, dysmenorrhœa, pressure and peritonitis are present also. Perforation of the dilated cornu or tube into the abdominal cavity or genital canal may also occur. When pyometra sets in, fever and pain are present; and perforation means peritonitis or prolonged suppuration of the sac.

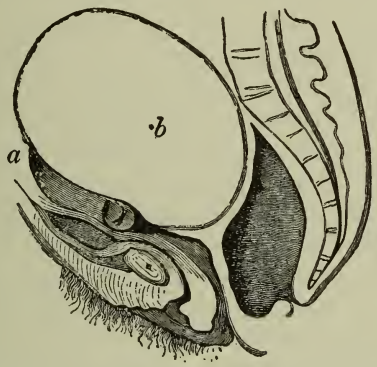

Fig. 30.—Hydrometra Lateralis. (After *Breisky.*) *a*, Open half; *b*, closed cornu distended by blood.

Sexual desire is unaffected. The possibility of coitus depends upon the condition of the vagina, as to whether the malformation extends so far, and the development of both canals. Usually they are of unequal diameter, and the wider one only is used; and if this wider one is blind, as sometimes occurs, coitus may be impeded, and conception prevented. Duplexity of the uterus alone never causes sterility; either half of the organ may become gravid. Defective development of the organ does not interfere more often with the pregnancy than is the case with the simple organ. The fœtus is usually carried to term, the muscular structure of the gravid half being almost as great as that of the single organ. The non-impregnated uterus usually participates in the pregnancy, hyperplasia of its walls, and formation of a decidua taking place. The only rare exception to this is when the second horn approaches a rudimentary cornu in its development. It is but little enlarged by the pregnancy, and, lying posteriorly, is lost in the abdomen. Only when the child has been born does it become prominent. If the uterus unicornis is also unicorporeus, both cornua will be dilated, that in which the buttocks lie directed upwards being largest, whilst the smaller cornu may contain the placenta. The more perfect the division, the more independent do the two uteri seem to be. Both cornua contract at the same time *inter partum* in the uterus bicornis unicorporeus; and when the two cornua are entirely divided we observe contractions and dilatations of the cervix in the unimpregnated half. In some cases, however, the latter takes no part in the birth. The independence may be so great, that when either half contains a fœtus, the contractions at birth may occur now in one and now in the other horn; and it may happen that the two fœtuses are extruded at periods far apart. Gonterman has described an interesting, and, I think, reliable case, in which pregnancy occurred alternately in either horn.

Woman thirty-six years old; always healthy; had menstruated regularly but profusely since her fifteenth year; for the first six years every pregnancy regularly ended in abortion at the third month; then followed a fully developed child; and then again there were two abortions, the last on December 30, 1877. Six weeks later her periods recommenced, and remained regular. Towards the end of March examination revealed a five months' pregnancy and the probable existence of a duplex uterus. In May the child was born; and examination showed that the ovum had been implanted in the left half of the uterus. The chances are that whenever the right half became gravid, abortion ensued. Two years later the woman again bore a living child from the left half, whilst the right had emptied itself of its contents at two months, and had gone on menstruating.

Twin pregnancies are not uncommon, one fœtus being in each cornu, or both in the one. Triple pregnancy has also been seen. It is doubtful if when there is complete partition up to the external genitals pregnancy can occur simultaneously. A true super-fecundation would have to occur. It is improbable, though not impossible, that super-fœtation (development of a second ovum in one half, whilst the first had already been impregnated from a previous ovulation) can occur. Our literature is unluckily not extensive enough to decide the question. (See Uterus Didelphys, page 235.)

The position of the fœtus corresponds to the shape of the uterus. When there is complete separation, uterus bicornis septus and uterus bicornis unicollis, the fœtus lies most commonly head downwards and vertical. If however there is a common uterine cavity, breech presentations are more frequent; and where there is simply a broadening of the uterus,—uterus arcuatus unicorporeus, —transverse positions are common.

But the position of the fœtus does not always correspond to the spindle shape of the uterus. We would expect that the curved back of the fœtus would always be applied to the concave wall of the cornu, so that in the right uterine horn one only, and in the left horn two positions would occur. But experience disproves this assumption.

Polaillon has observed placenta prævia with a number of these malformations, and attributes the condition to them. The relative width of the uterine cavity is supposed here, as in the simple uterus, to be the etiological factor in the condition.

Although pregnancy in general is normal in cases of uterus bicornis, labor is interfered with in a disproportionately large number of cases. Sometimes it is very tedious, and death of the lying-in woman from exhaustion has been recorded. Ruptures of the lower segment of the uterus have also been caused. The percentage of operative cases, and of deaths, is certainly above the average; and this applies not only to the uterus bicornis, but to malformations of the uterus in general (L. Grivow). This is due above all to the oblique position of the cornua, in consequence of which the longitudinal axis of the fœtus does not correspond with that of the pelvic entrance. There the presenting part may meet with other obstacles; the other non-pregnant but enlarged cornu may be in the way, or the head may be detained by the stretched abnormal ligamentum recto-vesical above mentioned. Sometimes these obstacles only result in delaying delivery, the uterus gradually straightening itself, and the non-impregnated cornu receding. But in other cases death occurs from exhaustion or from rupture of the stretched and contused lower segments of the uterus. The longitudinal vaginal septum also may interfere. There may be severe *post-partum* hemorrhage when the placenta is situated upon the septum uteri, and the insufficient muscular power does not completely close the gaping vessels

Childbed, save for accidental puerperal diseases, is normal in most cases; and involution occurs as rapidly as in the simple womb.

In cases where the cornua act independently, and of twins where one is extruded at a long interval of time from the other, the lochia and the milk may appear only after the second birth, or they may set in at once after the first, and stop after the second child.

It is remarkable that there is no case on record of pregnancy in the closed horn of a uterus bicornis, while it is not infrequent in the rudimentary cornu. At all events, I have been able to find no such case in the more recent literature of the subject (see Uterus Bilocularis).

If hematometra forms in the closed cornu the other half may be impregnated in spite of it. But the pregnancy is very liable to be interrupted.

The presence of a vaginal septum will always direct our attention to the anomaly we are considering, since they so frequently occur together. Strange to say, it is frequently overlooked, even when, as in labor and obstetric operations, the hand of the physician remains in the genitals for long periods of time. The reason is that the examining finger enters one canal, the septum is not noticed or distinguished from the wall of the vagina, and the second vagina is not seen at all as a separate channel. If the septum is incomplete, it is probably lax; it lies against the vaginal wall, and is overlooked. During birth the passage of the fœtal head still more fully obliterates the other canal. In the above-mentioned case of uterus unicornis with rudimentary cornu, I perforated without feeling the membrane. This has happened even to the most experienced obstetricians. There is a well-known and curious case recorded of a consultation between Mai and Fischer, two equally experienced obstetricians.

The case was apparently a simple one, but one physician found the os uteri well open, while the other found it closed. A violent dispute occurred, and when, to settle it, both made a re-examination, each found exactly the opposite of what he had before determined. The vagina was double, and the two cervices were in different conditions.

The diagnosis is easier when the vagina is single, and there are two cervices either separate or fused together. If two sounds are introduced, their points will diverge to left and right. Bi-manual rectal examination will now show the same state of affairs as in uterus unicornis, with the exception that it is found on both sides. We can through rectum or vaginal vault appreciate the course and direction of the two sounds. We will consider the possibility of confounding the condition with the uterus biforis, when we come to this latter affection.

If the cervix is simple, and childbirth has occurred, the lower border of the partition may be recognized by digital examination, or artificial dilatation may be effected. If the cervix is closed, the diagnosis may be made by the sound and rectal examination. Here also, as in the uterus unicornis, the one cornu may be mistaken for a fibromyoma if a sound cannot be passed into it, but the difference of consistency and shape should suffice to distinguish it. Mistakes are, however, possible; and very recently I supposed a second cornu to be a secondary cancer, in a case in which I had removed the carcinomatous cervix.

Much more difficult is the diagnosis when one cornu is imperforate and is distended into a tumor by blood, mucus or pus. The sac pushes the open half of the uterus to one side, and forces down the dilated cervix and the corresponding part of the vaginal vault. The lower the atresia, the deeper down will the tumor reach. Examination will undoubtedly reveal a tumor above the symphysis, although its cystic nature can only be ascertained when it is of large size. Bi-manual examination will show that the upper part of the vagina is filled with an elastic or distinctly fluctuating tumor. The lateral position of this tumor is alone sufficient to discountenance the idea of hematometra of the simple uterus; and the history of regular menstruation will also exclude it. One side of the vault is filled with the tumor; but at the other side the examining finger can be passed up, and here a cervix is discovered. Thus there must be a tumor filled with fluid alongside the uterus. The cervical canal which we have found is stretched and displaced, the external os is crescentic, and lies around the lower end of the tumor. If the uterine sound is now introduced, it passes into the uterine cavity, and can be felt outside the tumor. The change of the cervix, however, can only occur when a tumor is present which involves the walls of the cervix; and we can thus exclude all like tumors which lie without the uterus, such as ovarian and parovarian tumors, exudations and extravasations in the broad ligaments, retro- or ante-uterine hematoceles, etc. Fibromyomata of the cervical wall alone cause a similar condition; and here the history and the consistence of the tumor will prevent a mistake.

There is little information to be obtained from external examination. When the tumor reaches a certain size it applies itself to the non-dilated cornu, so that the angle between the two horns cannot be felt. Here again the sound will be of value. Puncture of the sac may be necessary before we can decide upon the nature of the tumor.

It is not difficult to decide whether the tumor contains blood, mucus, or pus. If a young person has menstruated regularly, and a tumor as above described has rapidly grown, it points to hematometra lateralis. If the individual, however, is amenorrhoic, if the tumor developes slowly and is but small, hydrometra is probably present. If after puncture the tumor reappears with great tenderness and the symptoms of peritonitis, the symptoms point to pyometra. This latter diagnosis is rendered certain when pressure upon the tumor causes pus to exude from the vagina or from the cervix. Of course, a purulent change may occur in the contents of a hematometra or a hydrometra.

As to the recognition of the uterus bicornis during gravidity, the important diagnostic point of the septum can with difficulty be recognized, and the results of vaginal examination, at the beginning at all events, do not differ much from those of the normal uterus. At the beginning of pregnancy external examination will reveal the enlargement of both cornua.

Later on the obliquity and pointed shape of the uterus may be of value, but, as we saw in the case of uterus unicornis, the first characteristic may occur with the normal uterus, and the second is soon lost as the organ increases in size. As a rule the lesser are more easily recognized than the more serious grades of the anomaly. If the division of the uterus is well marked, the non-gravid half hypertrophies, but does not dilate; it is displaced by the gravid half, and sinks downwards and backwards into the pelvis, especially when it is placed upon the left side. If there is little external evidence of division, it soon becomes lost as gravidity goes on. But when the uterine partition is very incomplete, and the fœtus occupies the entire cavity, the cornua are distinctly perceptible, as pointed or round prominences with a depression between them; and we can often demonstrate the presence of the fœtus in one half, while the other half is distended with liquor amnii only. The lesser grade of the anomaly,—uterus arcuatus—can be specially frequently diagnosed; and a little friction of the organ will cause such a contraction as to render its outlines distinctly visible. (See Hypoplasia Uteri.) Only when in uterus bicornis septus both cavities become gravid and enlarge, can this latter form of the abnormality be easily recognized, since the furrow at the fundus and the anterior surface of the uterus can be distinctly recognized. The demonstration of the round ligaments is often important in the diagnosis; they go outwards from the apices of the cornua.

The septum may be entirely overlooked; and it is often only when operative procedures, as turning or detachment of the placenta, have to be undertaken, that it is noticed.

Although I know no reported case of the kind, the non-gravid cornu might be driven down, and would then be with difficulty distinguishable from a rudimentary cornu.

During the uterine contractions, and for some days after labor, the peculiar shape of the uterus arcuatus can be distinctly appreciated. But it fades out as the organ gets smaller.

We are less in the dark as to the etiology of this condition than of the other anomalies which we have been considering. It occurs from only partial fusion of the middle portion of the Müllerian ducts as they lie side by side. This union, as we have seen, begins below, and extends upwards. The varying parts left ununited, go out to develop separately as if each were a uterus unicornis. But the septum also does not always disappear, and the lower parts, though outwardly single, may still be really double. Nor do the separated parts develop equally always. All this occurs in the first two epochs of uterine development.

And here we approach an explanation of the real cause that hinders normal growth. The vesico-rectal ligament above mentioned has not yet been referred to any embryonal structure in the regular order of development, but it occurs so frequently with marked division of the uterus, that it must stand in some causal relation to the abnormality. (See Uterus Didelphys, page 235.)

Treatment is neither necessary nor possible for the deformity itself. If the septum vaginæ interfere with cohabitation, it should be divided or removed. Only when atresia has set in in one half, and blood or mucus has collected, do we need to interfere actively. The chances are that the tumor will get larger; and to avoid the dangers of a considerable collection of fluid, an early opening is necessary. This is best done at the most dependent point of the tumor, in the vagina, save when exceptional thinning at some other part, as the cervix, shows that that is the preferable place. In no other gynecological operation of similar small importance in itself is so much caution necessary. Abdominal pressure must be avoided; the puncture must be simple, and the outflow slow. The dangers are indeed great, and a whole series of deaths have already occurred after opening an imperforate cornu of a uterus bicornis. Simple puncture, however, is merely palliative; the orifice soon closes, and the fluid reaccumulates. Olshausen only has succeeded in curing a case by two punctures; the woman in question had three normal children afterwards. We must endeavor to secure a permanent communication between the sac and the genital canal.

Even puncture above needs much care, since masses of blood or mucus may easily remain behind, undergo septic decomposition, and lead to pyometra. A. S. Galabin has observed an exquisite case of this kind:

A blood-tumor the size of the womb at the fourth month was incised in a fifteen year old girl. Peritonitis and septic endometritis followed, to which the patient succumbed upon the twelfth day after the operation.

The sac must be incised after evacuation, or, better, a portion of tissue must be excised from its wall, and, if possible, the mucosa united over its edges. The sac must then be well washed out or drained. If pyometra forms after puncture, we must have recourse to incision as above.

Extirpation of the tumor by laparotomy is not justifiable so long as it can be reached *per vias naturales*.

John Homans has cured a hematometra in a uterus bicornis, where the tumor projected into the pelvis, by supra-vaginal amputation.

The most serious complication, the tubal sac filled with blood and mucus, and which may not be connected with the uterine cornu, and evacuated by its puncture, is best regarded as a *noli me tangere*. If rupture threatens, or if there are recurrent neighboring inflammations, operation is inevitable. Puncture can best be done from the cavity of the formerly closed cornu, or from the vagina; and measures must be taken to maintain the passage open. The results have not been bad. Rectal puncture is not so good, nor is puncture through the abdominal wall, since these tumors are small, and rarely reach it. Salpingotomy may be done in extreme cases; the operation is as justifiable as ovariotomy, or uterine extirpation. Adhesions are frequent; and stitching the sac to the abdominal wound, with subsequent incision, may be necessary.

What we have said above in regard to castration in cases of blood accumulations in rudimentary cornua is true also for atresias of the uterus bicornis. (See Tubal Diseases and Gynatresias.)

As to the treatment of obstetric cases, the head may sometimes be impeded by the ligamentum vesico-rectalis. Sometimes the mere correcting of the obliquity of the pregnant cornu, or placing the patient upon the side corresponding to the non-pregnant half, will suffice; if it does not, podalic version and extraction must be done. The non-distended cornu may be forced down; the treatment is then the same as that of a rudimentary cornu under like circumstances. If the vaginal walls or bands in the vagina or cervix are in the way of the advancing head, they must be pushed to one side, or divided. If hematometra lateralis is present, the sac must be early decreased in size, so as to leave room for the passage of the head.

When there have been twins, one has been born after the other, and no trouble has ensued. There is danger of *post-partum* hemorrhage, however, on account of deficient uterine development and the possible location of the placenta upon the septum.

CHAPTER XXXIV.

THE TWO-CHAMBERED UTERUS.

(*Uterus bilocularis.*)

BY this we mean a uterus outwardly simple, though rather broad, but divided internally into a more or less complete right and left cavity, by a partition starting at the fundus of the organ. As in the uterus bicornis, the dividing membrane may involve the entire genital tract, from the fundus to the hymeneal ring. If it extends to the external os, we have a uterus bilocularis septus sine completus; if only to the internal os, we have a uterus bilocularis unicollis. If it does not extend even so far, we have a uterus bilocularis unicorporeus.

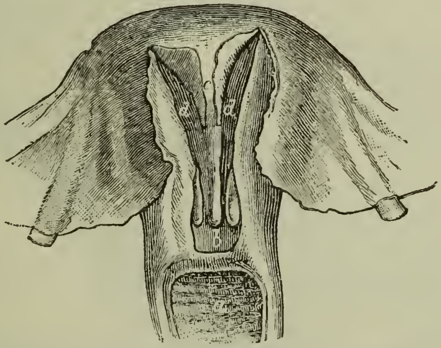

FIG. 31.—UTERUS BILOCULORIS UNICOLLIS. (After *Grauel.*) *a*, Vagina; *b*, simple os externum; *c*, septum; *d*, *d*, the two loculi; *e*, fundus.

Naturally, there occur all manner of transition forms between uterus bilocularis and uterus bicornis, and the varying forms may be reckoned now in one category, and now in the other. Thus the uterus arcuatus, with a more marked partition, would belong here, and not to the uterus bicornis.

The external form of the bilocular womb is rarely perfect. Both sides are seldom equally developed; and Klob claims that we frequently see a long band running up and down, but especially marked upon the posterior surface of the womb. The organ is regularly increased in its transverse diameter, though it is usually of normal size, as a whole.

Internally, the dividing wall may end crescentically, or it may be continued lower down as a fold or beam. It may be perforated in various

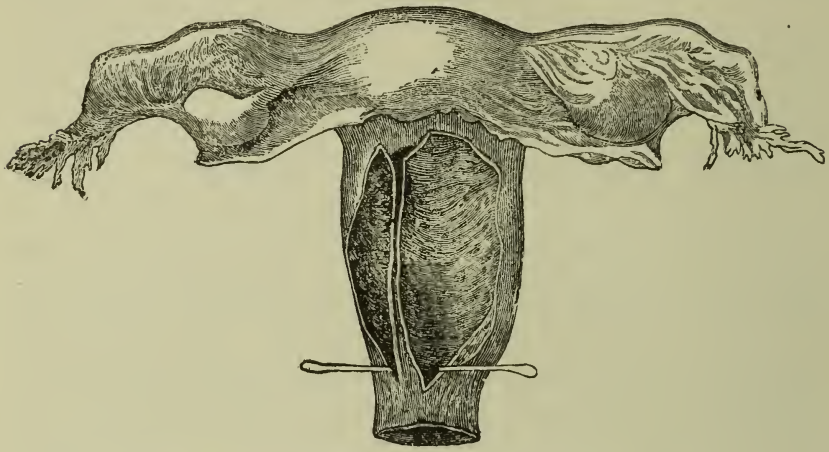

FIG. 32.—UTERUS BILOCULARIS. (After *Liepmann.*) Both vaginæ are opened.

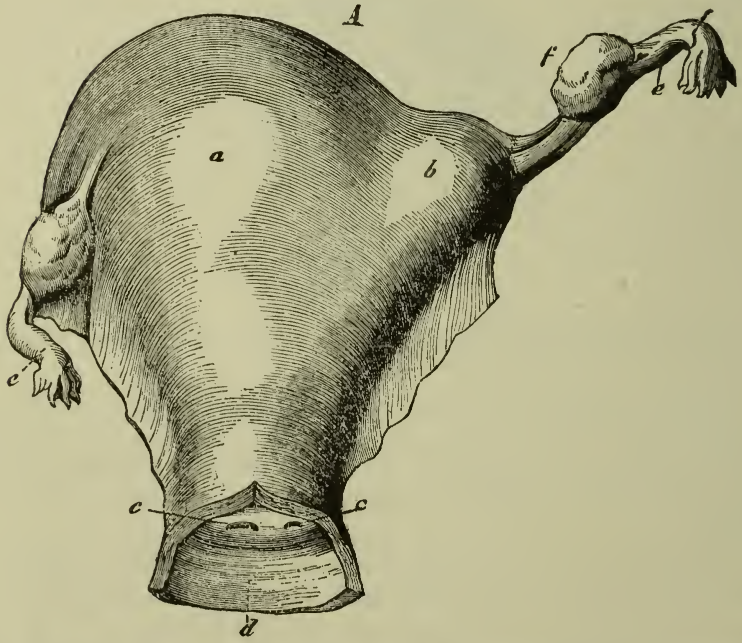

FIG. 33.—UTERUS GRAVIDUS BILOCULARIS. (Transition form to uterus bicornis.) Posterior aspect. (After *Cruveilhier.*) *a*, Right cornu; *b*, left cornu; *c*, orificia externa; *d*, vagina; *e*, tubes; *f*, ovaries.

places. In fact the uterus bilocularis is the transition form between duplexity of the uterus, and those less-marked congenital anomalies of the genital canal, which are met with in the vagina as unimportant membranes and cords.

Atresias of one, usually somewhat atrophied half, may also occur, though more rarely than in uterus bicornis.

The anomaly originates in the same period as does that of uterus bicornis, but somewhat later. The Müllerian ducts coalesce, but the partition wall disappears only partially, or not at all. The cause of the faulty development is probably the same as in uterus bicornis. Perhaps the above-mentioned fold upon the anterior and posterior wall has something to do with it, but we will say more about this when we consider uterus didelphys.

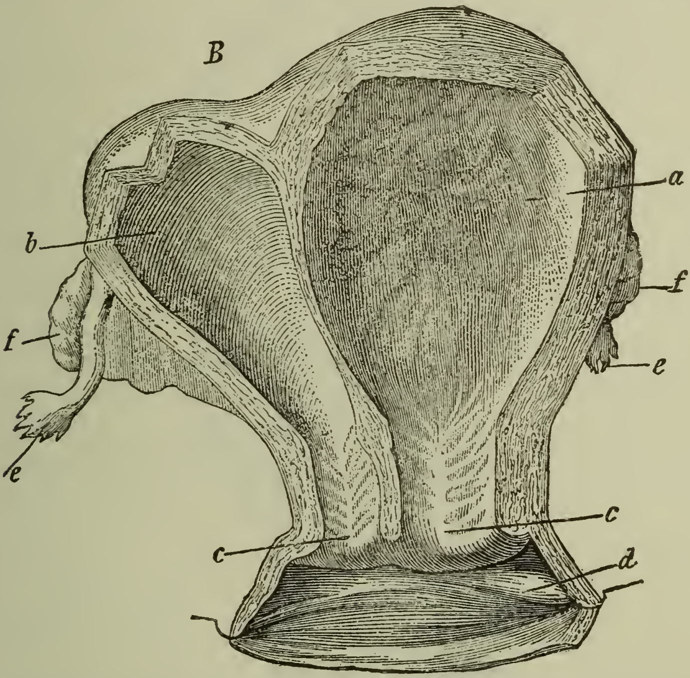

FIG. 34.—THE SAME UTERUS OPENED FROM THE FRONT. (After *Cruveilhier*.) *a*, The more strongly developed loculus; *b*, the less developed right side; *c*, the external orifice; *d*, vagina; *e*, *e*, oviducts; *f*, *f*, ovaries.

The physiological processes are the same as in uterus bicornis. One case exists, reported by W. B. D. Blackwood, in which menstruation occurred alternately from one and the other cavity:

The patient, twenty-two years old, complained of pains in the left hypochondrium, which became quite severe at every other period. Examination showed a hymen with two openings, two completely divided vaginal and uterine cavities, and a single corpus. In twelve consecutive menstrual epochs he observed that hemorrhage occurred alternately from one or the other uterine cavity. The dysmenorrhoic symptoms of the left ovary were specially well marked when hemorrhage occurred from that side. Only twice did the flow come twice in succession from the left cavity.

Here also the imperforate half may become distended with blood, mucus or pus, and the same results ensue as in the case of the bicorned womb. The same may be said about cohabitation and conception. If pregnancy occurs, the non-gravid half of course participates in the general hypertrophy, and it becomes almost as large as the pregnant half. The cavity also is lined with a decidua.

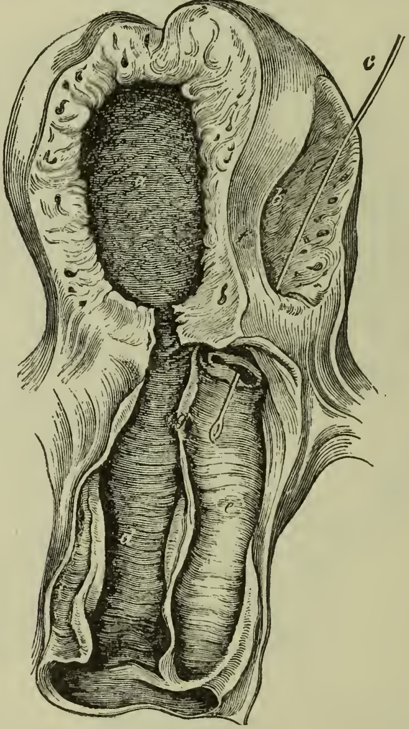

Fig. 35.—Puerperal Uterus Bilocularis. (After *Späth.*) *a*, Right loculus, which contained the ovum; *b*, left empty loculus; *c*, sound passed through the cervix of the empty half into the vagina; *f*, partition wall of the uterus; *g*, vaginal septum.

The pregnancy is rarely interrupted, and the fœtus, save in miscarriages and the transition forms to uterus bicornis unicorporeus, is vertical, and with the head presenting. The pregnant portion is not displaced, nor does the non-gravid part interfere. Only the partition wall itself may give rise to trouble; it may be necessary to tear it in extracting the fœtus. Very profuse hemorrhages may occur if the placenta is partially seated upon the poorly muscular and thinned partition wall.

Twin pregnancies have hardly been noticed in this form of anomaly. The puerperal period has naturally not so good a prognosis as is the case with the simple uterus.

While we have many cases of gravidity in rudimentary cornua recorded, we search in vain for examples of pregnancy in the imperforate half of a uterus duplex. For the closed half menstruates, and cases of hematometra lateralis are not uncommon. Perhaps gravidity does occur in the occluded loculus, but is misunderstood. This may be explicable as follows:

The tumor of an imperforate half of the uterus bilocularis and bicornis displaces the os of the patent half, and so does the advancing head in labor. Such latter cases would then closely resemble the frequently described cases of atresia of the simple pregnant uterus. Many such cases of apparent occlusion of a simple os externum, in which instruments had to be used to open a passage, may have been instances of this anomaly.

The diagnosis of the anomaly presents many difficulties. The external shape of the organ will hardly give us any clue, though the partial or complete duplexity of the vagina may excite in us the suspicion that the same malformation occurs higher up. When once the cervix is dilated, and the membranes are felt in it, and bi-manual examination shows that the body of the organ is single, it could only be confounded with the uterus biforis, of which more as we proceed.

The diagnosis may be confirmed by introducing two sounds into the fundus, and getting no feeling of metallic friction when we endeavor to rub their points together.

In gravidity the unimpregnated half lies closely applied to the gravid womb, and cannot be diagnosticated. In most cases, when the vagina is empty, the anomaly can only be recognized at birth, when the hand is introduced into the uterine cavity.

The treatment also is entirely the same as in uterus bicornis, save that it is simpler, in that a series of disturbances which are common in the two-horned uterus cannot occur. Obliquity of the uterus and abnormal position of the head is not usually seen. It is rarely necessary to turn, since the broadening is not great enough to cause a transverse position, and the rudimentary half offers no hindrance to delivery. Only the septum can be in the way, and may necessitate interference; and the placenta may be partly implanted on it, and so give rise to hemorrhage. But the usual measures for atony of the uterus will suffice.

The splitting of the uterine septum is the only process which might involve any special action. C. Ruge has recently done it on a woman who had been twice pregnant, and miscarried both times. He supposed that the one loculus was not large enough for the fœtus at the latter end of pregnancy. The woman carried the third child to term. Unfortunately this operation can be done in the two-chambered uterus, but not in other forms of duplexity.

CHAPTER XXXV.

THE DOUBLE UTERUS.

(*Uterus didelphys.*)

HERE the organ is divided vertically into two halves, each of which has developed into a complete and independent uterus. There is no adhesion, and no common wall.

It was formerly supposed that this abnormality only occurred in non-viable monstrosities, especially when the lower part of the abdomen of the fœtus is chiefly affected. But though most pronounced in these, it also occurs in other cases. It occurs most often with fissure of the bladder, atresia ani, and the presence of a cloaca. The two halves of the organ then form pillar-like laterally curved bodies, the pointed ends of which are continuous with the normal or rudimentary tubes. At their lower extremities they sometimes end in distinctly separable vaginæ, which open into the bladder, into the cloaca, or, more rarely, into the rectum. But more frequently the uteri end directly, without vaginæ, in these cavities. The uteri may be solid, and then they belong rather to the uterus rudimentarius bipartitus than here, but in most cases they are hollow.

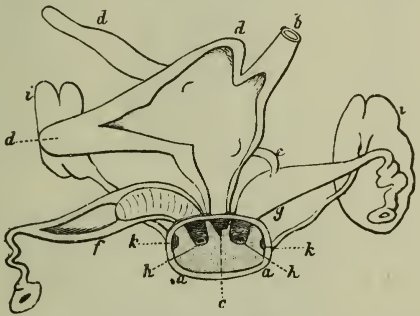

FIG. 36.—CLOACA, WITH VESICAL FISSURE AND UMBILICAL HERNIA. Uterus didelphys. (After *Meckel.*) *a*, Vesica; *b*, small intestine opening into a wide pocket; *c*, anterior opening of this pocket; *d*, cœcum; *d′*, remnant of large intestine, ending blind; *e*, processus vermiformis; *f*, right vagina and uterus opened; *g*, left vagina and uterus; *h*, openings of vagina in bladder; *i*, both kidneys; *k*, openings of both ureters into the bladder.

The two halves are usually widely separated, and between them lie urachus, bladder, and rectum. Often there is a distinct recto-vesical ligament.

Until recently this anomaly has not been seen in adults; and Mayrhofer yet believes that it only occurs as part of a series of malformations which render life impossible. But we now know that some cases which were formerly supposed to be examples of the higher grades of uterus bicornis really belong here. If the drawings are correct, it is a question whether the repeatedly reproduced cases of Cassan and of Eisenmann are not really cases of double uterus. And a number of *post-mortem* cases and specimens have now been shown to be cases of uterus didelphys. C. L. Heppner's case is usually classed the first of these.

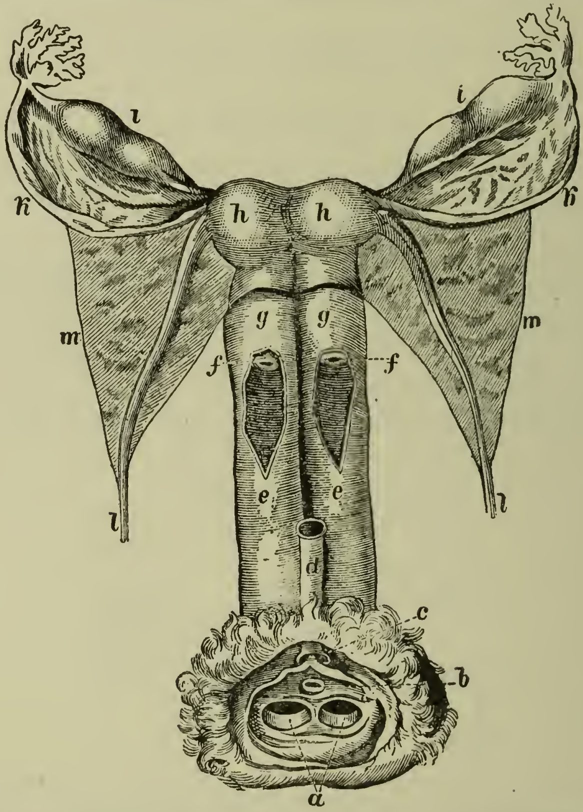

FIG. 37.—SO-CALLED UTERUS BICORNIS. (After *Eisenmann.*) *a*, Double introitus and hymen; *b*, ostium urethræ; *c*, clitoris; *d*, urethra; *e*, *e*, vaginæ; *f*, *f*, orificia uteri; *g*, *g*, cervices of uteri; *h*, *h*, bodies and cornua of uteri; *i*, *i*, ovaries; *k*, *k*, oviducts; *l*, *l*, round ligaments; *m*, *m*, broad ligaments.

Instead of the vagina there was a quadrangular, thick, solid, musculofibrous plate, 1.9 inch broad, and about .5 inch thick, which was continuous at its upper border with the rounded uterine columns. These were solid, 2.6 inches long, running upwards and backwards, and forming at their upper extremities club-shaped protrusions half an inch in size. A body and a cervix may be distinguished in each cornu. Neither is hollow. Tubes in general normal. Ovaries show scars, distinct menstrual corpora lutea, and a few Graafian follicles.

Now it is at once apparent that this is a case of rudimentary uterus or uterus bipartitus, and not one of uterus didelphys.

A case of A. Ollivier's was decided by *post-mortem* examination.

The patient was forty-two years old, and had been married since her twenty-fifth year; confined four times normally, at the ninth month, after having had three eclamptic attacks. She felt sick during the puerperium, and died three months later, the diagnosis being cirrhosis of the liver.

The autopsy revealed two uteri, widely separated by intestinal coils. The right organ was like that of a multiparous woman, and larger than the left, which was virgin in size. The left portio vag. was plump, and the edges of the orificium uteri externum were irregular and everted; the right portio was virginal.

The adnexa were normal. From the external border of each fundus proceeded one lig. rotundum, one tube, and one lig. latum.

The vagina was completely divided by a median wall, which ended anteriorly in a triangular fold which projected beyond the level of the external genitals a little.

Here the division was not only complete throughout the entire tract, but the uteri themselves were widely separated. Ollivier mentions a case of Bonnet's, who had observed the same condition of things in a woman twenty-five years old.

But clinical examination also has in recent times proved the existence of uterus didelphys in the adult. A whole series of such cases has been recorded, although some of them were undoubtedly cases of well-developed uterus bicornis.

Perhaps the most marked of the recent cases is that of J. Heitzmann:

A girl twenty-three years old had been long treated in vain for a blennorrhoic discharge. A careful examination showed a fleshy vaginal septum two lines thick, extending from the point of meeting of the middle and lower third to the fornix, and dividing the organ into two unequal but fully developed halves. The sound showed the left uterus to be two inches and the right one 1.8 inches long; and, while the sounds were *in situ*, it was easily perceived that the lower parts of the colli were united, but that the upper parts of the bodies were movable and widely separated. The two vaginal portions were one inch, and the two funduses, 2 to 2.4 inches apart. One tube and one ovary were apparent on each side. The girl had menstruated since her fifteenth year, normally.

Here the entire organ was widely separated, even the cervices, and the case is one which is beyond dispute.

Each half of the uterus didelphys conforms in position, shape, and adnexa to a uterus unicornis without rudimentary horn. The bodies are entirely separated, and the cervices, though distinct, are separated by a membrane which ends above in a free border. This membrane is composed of connective tissue, fat, and elastic fibres; and it contains no smooth muscular fibres. Its thickness varies as the two halves are more or less separated. Even if both cervices lie side by side, and there is no connecting membrane, each half is independent. Of course the diagnosis may be difficult in the living subject, especially as transition forms between this and uterus bicornis occur

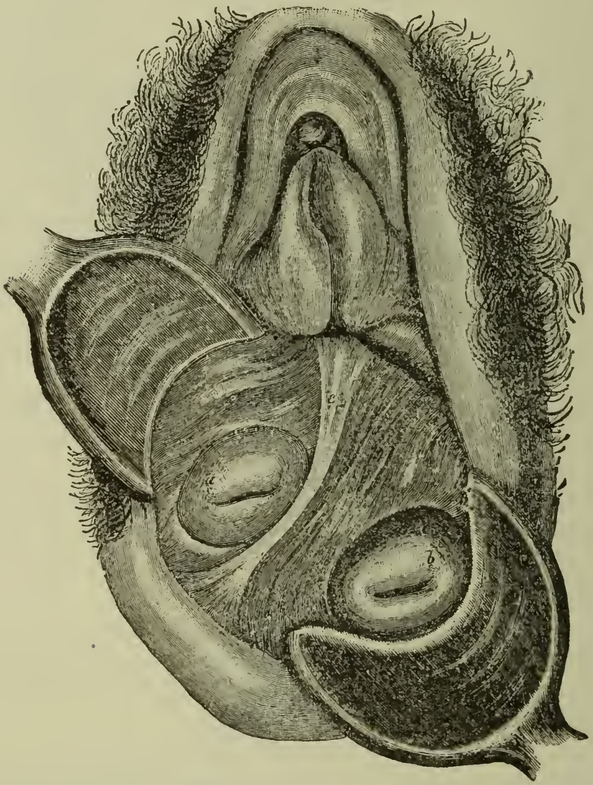

FIG. 38.—UTERUS DIDELPHYS. (After *Heitzmann.*) *a*, Vaginal portion of left uterus; *b*, vaginal portion of right uterus; *c*, septum in vaginal vault.

It is remarkable that, though we have but few *post-mortem* records of these cases, the ligamentum vesico-rectale is not mentioned. It must occur, and, as we have seen, it is sometimes marked in cases of uterus bicornis.

The vaginal partition may be complete, and it is common to both canals. Or it may be incomplete, merely dividing the vault. Or again, the vagina may be entirely simple, or its division be only indicated by a sickle-shaped projection in the vaginal vault.

Atresias can occur here as in the other duplex conditions of the genitals, and lead to the same results.

The cause of uterus didelphys must take effect early in the first period, before the Müllerian ducts have approached one another and coalesced, before the eighth week of embryonal life. Undoubtedly the simple organs, which normally lie before and behind the uterus, push themselves in between the Müllerian ducts, and prevent their union. This we see most plainly in those non-viable deformities in which there is abdominal, vesical, and pelvic fissure. The umbilical vesicle is drawn strongly downwards, and thus the closure of the lower part of the abdominal wall is prevented. This tension is transmitted to the intestines, which are thus drawn down between the two lateral rudiments of the internal genitals. This, however, does not explain the existence of the abnormality where there is no vesical fissure and consequent intestinal tension. Here those deformities which are dependent upon an over-distension of the allantois or bladder, and of the intestine or rectum, may help us. These are mostly dependent upon atresia of the orifices of these cavities. These dilated

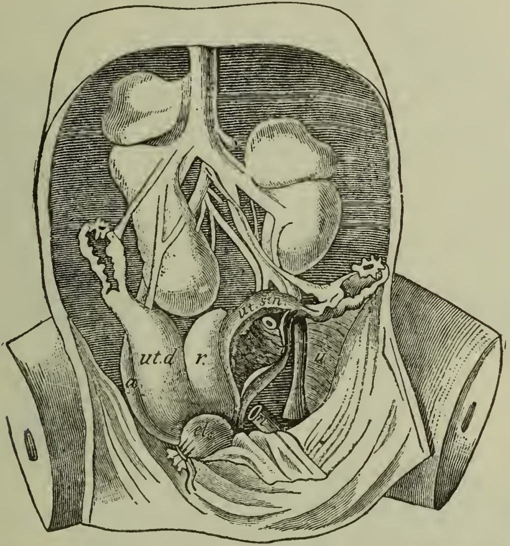

FIG. 39.—COMPLETELY DIVIDED UTERI AND VAGINÆ IN A CHILD AT TERM WITH ECTOPIA VESICÆ. (After *Fränkel.*) *ut. d*, Right uterus and vagina; *ut. sin*, left uterus, vagina laid open, so that the os externum can be seen; *il*, piece of small intestine; *r*, rectum, atresiad, and lying between the utero-vaginal tubes; *a*, simple umbilical artery; *v*, umbilical vein; *u*, left ureter.

organs may entirely or only partially prevent the approach and coalescence of the Müllerian ducts. They also cause uterus bicornis; but here they begin to act only when union of the lower parts of the ducts has already taken place.

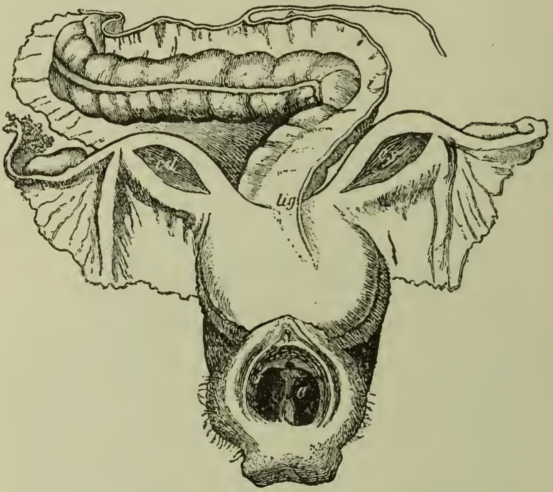

Fig. 40.—Uterus Bicornis, with well developed Ligamentum Recto-vesicale. (After *Schatz.*) *e*, Vagina with septum; *c*, *d*, right cornu; *c*, *s*, left cornu; *i*, intestine drawn in between the cornua; *lig*, well-marked recto-vesical ligament.

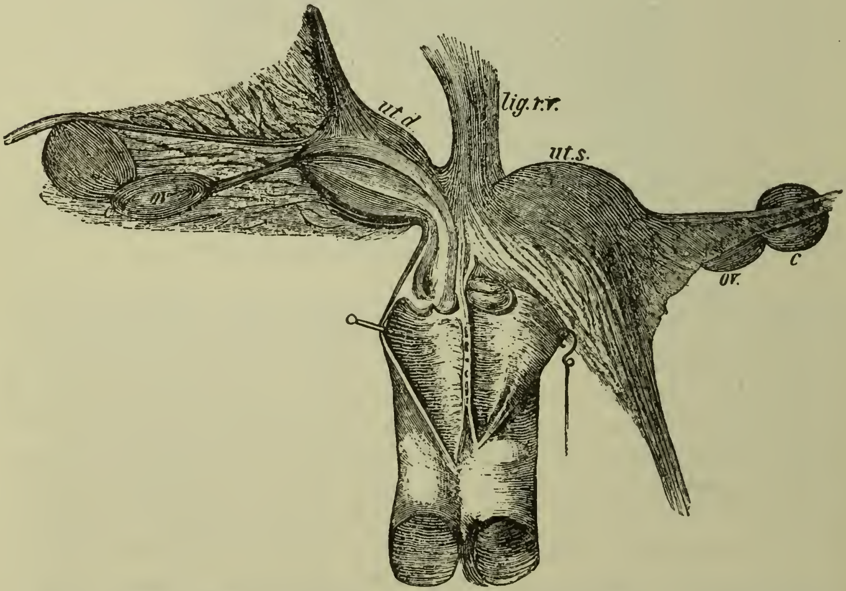

Fig. 41.—Double Uterus with Recto-vesical Ligament. (After *Cassan.*) *u*, *d*, Uterus dexter; *u*, *s*, uterus sinister; *ov*, *ov*, ovaries; *c*, *c*, cysts connected with the ovaries; *lig. r. v*, ligamentum recto-vesicale.

But to the vesico-rectal ligament belongs a great share in the causation of these deformities. We cannot at present say positively that it is a rudiment of some embryonal structure. The vesical and intestinal canals may later return to their normal size; and the peritoneum between them, which had not developed as usual while they were in apposition, is put on the stretch, and developed into a fold. This fold would then go on to develop as the other organs do, and, like other peritoneal reduplications, may contain muscular elements from the uterus.

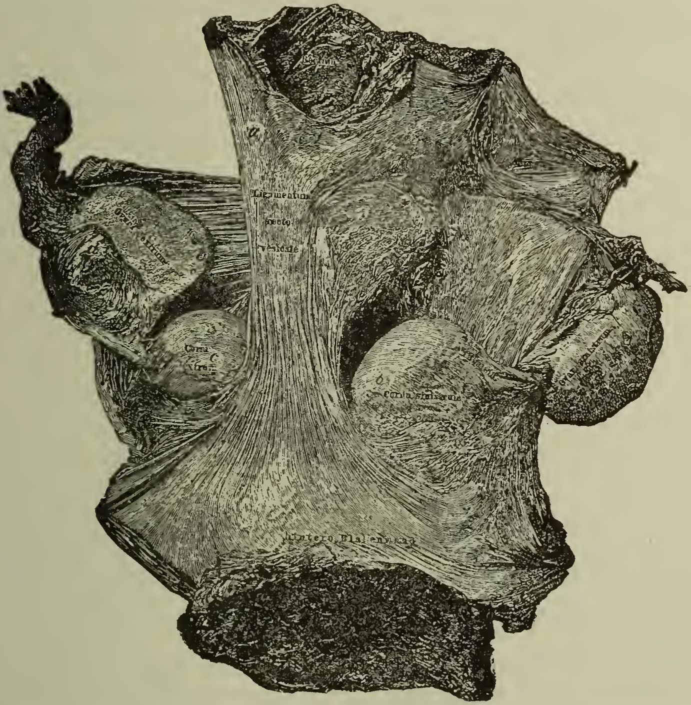

FIG. 42.—*a*, Ligamentum recto-vesicale; *b*, cornu sinistrum; *c*. cornu dextrum uteri; *d*, right ovary; *e*, left ovary. (After *Winckel.*)

Another explanation may be given by the inflammatory processes which undoubtedly play so important a part in the etiology of these abnormalities. Adhesive inflammation may unite the contiguous surfaces of bladder and rectum; and when the organs contract again, the adhesion is stretched into a band. It is no objection that there are no cicatrices; for we know that atresias occurring in childhood not infrequently leave no scar tissue. And Schatz says that in his case, in which the ligament in question was very well-developed, there were also other bands which united the coils of the ilium to one another. This was the case in Winckel's two cases, and in the case of atresia ani recorded by Th.

Weiss. But it is more difficult to understand how an inflammatory band can, like a normal one, subsequently develop into the ligaments which Winckel and Cassan have figured. In Freudenberg-Schröder's case of uterus didelphys, the rectum was found between the two halves, and adherent to them.

It is interesting to note that in uterus bilocularis also we sometimes find folds running from bladder to rectum and through the uterus. Are they analogous to the ligamentum recto vesicalis? If they are, the halves of the womb must have united in spite of the latter, and have included it between them.

The number of positive cases of uterus didelphys is too small for us to form any correct clinical picture of the anomaly, nor can we say whether the functions of the two divided halves are also complete.

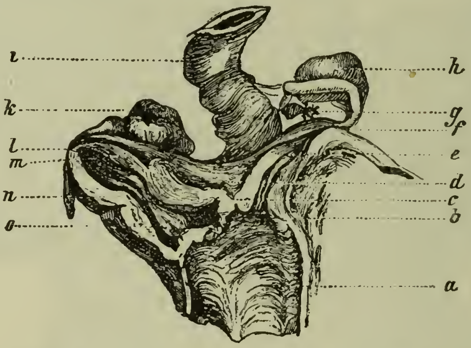

FIG. 43—UTERUS DIDELPHYS. (After *Schröder-Freudenberg*.) *a*, Vagina; *b*, septum vag. rudim.; *c*, point where the two external orifices touched; *d*, tissue uniting both cervices; *e*, os internum sinistrum; *f*. fundus uteri sinister; *g*, tuba sinistra; *h*, ovarium sinistrum; *i*, rectum; *k*, ovarium dextrum; *l*, fundus uteri dextri; *m*, tuba dextra (point of rupture); *n*, os intern. dextr; *o*, point of excision of the imperforate os extern. sinistrum.

As to menstruation, it is normal. There is no alternation between the two organs, as has been seen in some cases of duplexity of the organ.

Atresia and unilateral hematometra may occur. F. Freudenberg has described a very interesting case of the kind which occurred in Schröder's clinic, and which came to the *post-mortem* table:

A hematometra lateralis with simple vagina was diagnosed in a poorly developed girl fifteen years old. After puncture the canal closed, and a new blood-tumor formed; so two years later puncture was done again, a portion of the occluding membrane excised, and the uterine united with the vaginal mucous membrane so as to form a new canal. The patient died with symptoms of peritonitis, caused by the rupture of a pyosalpinx. The autopsy showed that both uteri were completely separated, and that between them, and united to them, lay the rectum. The right uterus was dilated by blood, the cavity being .26 inches long; the left was smaller, and club-shaped; it measured 1.4 inches. The two cervices were united by a triangular plate, only their lower extremities being directly in contact. The vagina was simple. There were numerous perimetric adhesions.

Lebedew's case ran a more favorable course. One half of the genital canal was closed by a hymeneal atresia, and hæmatometra lateralis developed.

The patient was a teacher, twenty-one years old, and had amenorrhœa and abdominal pains. These pains returned every three weeks, and became specially severe after October, 1880. From March, 1881, they were constant, and accompanied by diarrhœa.

When examined under chloroform, rectal touch revealed a fluctuating tumor filling the vagina, and divided above the small pelvis into two lateral masses. Division of hymen with outflow of tar-like blood; introduction of rubber tube; cessation of hemorrhage on the third day.

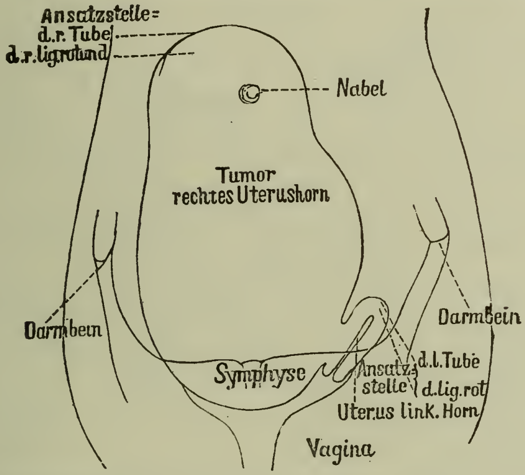

FIG. 44.—UTERUS DUPLEX (DIDELPHYS) WITH HÆMATOMETRA LATERALIS. (After *Staude*.)

Subsequent examination showed complete division of the vagina to within half an inch of the hymen, double portio vaginalis, and completely divided uterine cornua. The sound showed the right horn to be four, and the left to be four and a half inches long.

C. Staude's case, in which the right uterus as well as the vagina was filled with blood, is interesting. The retention tumor displaced the empty uterus to the left, without, however, disturbing the shape of the vaginal portion. It was supposed to be a cervical tumor, and was punctured after the laparotomy. After the diagnosis was made the puncture was closed, and a vaginal communication established. The patient recovered, but succumbed six months later to an intercurrent affection.

The illustration shows very plainly that the case was one of uterus didelphys.

Conception is not interfered with if the vagina is not (as in Tauffer's case) rudimentary, and unfit for cohabitation. A case is recorded by Satschowa in which both cavities were gravid.

The woman, twenty-six years old, had aborted once, had one year before borne a child at term, and was now again three months pregnant. She consulted Satschowa for a violent hemorrhage. The first examination revealed only a vagina and a two-months' pregnant and aborting uterus. Only after the woman herself had drawn his attention to the abnormal structure of her sexual organs (she had been told by a former physician of hers) was the following found: external genitals normal; .4 inch from introitus begins a complete vaginal septum; two complete uteri, both gravid; the left containing a one and a half months' and the right a three months' fœtus.

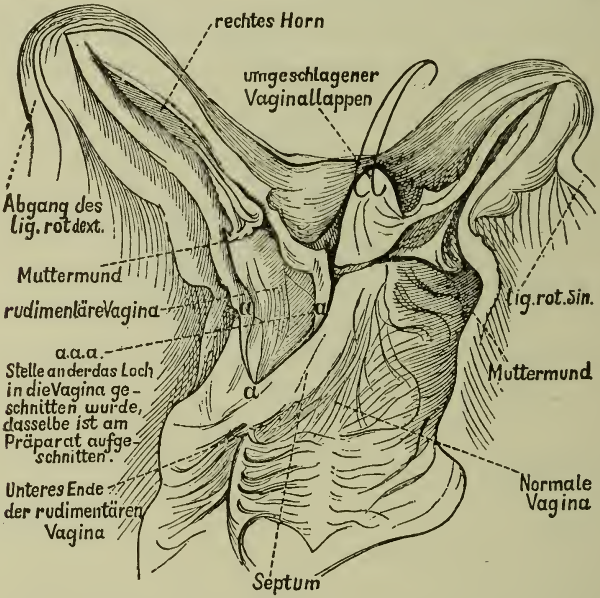
rechtes Horn
umgeschlagener Vaginallappen
Abgang des lig. rot dext.
Muttermund
rudimentäre Vagina
a.a.a. Stelle an der das Loch in die Vagina geschnitten wurde, dasselbe ist am Präparat aufgeschnitten.
Unteres Ende der rudimentären Vagina
a
a
a
lig.rot.Sin.
Muttermund
Normale Vagina
Septum

FIG. 45.—UTERUS DUPLEX (DIDELPHYS) WITH HÆMATOMETRA LATERALIS. (After *Staude.*)

Satschowa believed that he found a certain case of super-fœtation, but the two fœti were not described sufficiently in detail for us to decide.

Childbirth at term does not seem to differ from that of the uterus bicornis, as the following case of F. Benicke will show:

The uterus lay in the middle of the abdomen; but there was no sign of bicornity about the fundus. The introitus was divided by a septum into a wide left and a smaller right opening, and the vagina into two canals, of which the left was the wider. In the left vaginal vault the os was completely dilated, and the head could be felt; in the right was a swollen and relaxed portio with closed opening. The body of the closed uterus could not be felt; the sound passed backwards 4.4 inches. Labor was ended with the forceps.

During narcosis it was distinctly perceptible that the uterus was bifid down to the vaginal portion.

Thus the non-puerperal half seems to participate in the hyperplasia; but, as in most other cases of uterine reduplication, it could not be felt during pregnancy. Nor was the form of the organ abnormal, any more than in uterus bicornis.

Delivery and the puerperium occur exactly as in uterus bicornis.

Delivery at term from both uteri has not been observed.

The duplexities of the uterus have played an important part in the questions of super-fecundation. It seems certain that super-fecundation (impregnation of several ova of the same period by various coituses) occurs in animals, and it probably does in man, but super-fœtation (impregnation of several ova from various periods of ovulation and one pregnancy) is very doubtful. For though until the decidua unite, and even later (as in hydrorrhœa gravidarum), the path of the semen is open, yet ovulation does not occur while pregnancy exists, and super-fœtation seems impossible. But it is different when extensive duplexity of the genital canal exists. Not only has the semen free passage to the ovary, but it is by no means so certain that all ovarian activity ceases when one side is impregnated. If the observations since Kussmaul's time are reliable, there seems to be a certain amount of independence of function in each side in these cases. Thus, in twin pregnancy one fœtus may be born, and the other uterus may remain quite passive, and only expel its contents much later. Menstruation, also, is peculiar; not only may the wombs alternate, but the functions may be entirely independent. If one half is pregnant, the other menstruates normally through the entire pregnancy. All this points to a difference in the relation between ovulation and menstruation in these cases and in normal ones; and the cases show that ovulation can go on in the other ovary during gravidity. Thus super-fœtation seems not to be impossible when there is marked duplexity of the uterus.

I am well aware that many cases can be urged against this view; cases where one fœtus is cast off, and its twin goes on developing; where hemorrhages continue after pregnancy has set in; and I do not deny the difficulty of bringing this hypothesis into union with our conceptions of the central organs. But it explains the occurrence of fœtuses of different stages at one time, or of the same stage at different times, better than to suppose that one fœtus developed more slowly, or at times stopped developing. Besides, veterinarians do not deny the probability of superfœtation in animals with uterus bicornis and uterus bicorporeus.

This diagnosis of uterus didelphys is certainly much easier than that of other faults of uterine development. The presence of a vaginal septum should excite in us suspicion of duplexity, but it is undoubtedly frequently overlooked, both during gravidity and outside of it. The presence of two completely separated vaginal portions speaks for a double uterus. For the uterine rudiments unite from below upwards, and if the cervices are separated, the bodies undoubtedly are. If, however, the cervices are applied to each other, a sound must be introduced into each os, and bimanual examination undertaken, best per rectum, to differentiate the condition from uterus bicornis. The finger can then be passed between the sounds, and the whole organs be demonstrated as separate; while in uterus bicornis the cervix uteri is simple, though it may be broadened. Possibly also the two halves in uterus didelphys will be more movable.

We must admit, however, that when the cervices lie very close together, or when the above-described connecting band is very thick, the differential diagnosis may be rather uncertain.

Unilateral blood accumulation can also be recognized easily. The condition of the os will enable us to decide whether the blood is in a double, or simply in a bicorned or bi-chambered womb. For in the two latter cases the partition wall takes part in the tumor of blood, mucus, or pus; the unclosed cervical cavity is dilated, and the os externum forms a crescentic fold lying around the tumor. If, however, the open cervix is independent, as in uterus didelphys, the closed cervix does not influence it; its shape is unchanged, and the unclosed organ behaves like a simple organ displaced by any tumor. This is of importance also in the general differential diagnosis of pelvic tumors.

As we have seen, the non-impregnated womb can only be recognized at the beginning of pregnancy; the motility of the organs being such that the gravid womb soon lies over and displaces the unimpregnated organ, so that it cannot be felt. The pointed shape of the fundus also seems to give us but little help, especially in multiparæ, and we have seen that the same is the case in the uterus unicornis. But so long as the presenting part has not entered the pelvic canal, and the cervix has not been distended, the two separate vaginal portions should enable us to make the diagnosis. At birth itself the cervix of the non-impregnated uterus will not change its shape; while in the uterus bicornis and bilocularis, the os externum of the empty half, following the dilatation of the entire cervix, will be transformed into a wide, crescent-shaped pocket. I consider this sign so characteristic that I think that all the older recorded cases in which the second os, though it opened at delivery, yet did not change its shape, are cases of double uterus.

Benicke's case shows that bi-manual examination is quite sufficient to effect a diagnosis of double uterus after delivery, and during the puerperium.

We possess as yet no observations which will enable us to decide as to the possibility of diagnosis when both portions are pregnant, or in labor.

As to the treatment of the anomaly, that is neither possible nor necessary. Any trouble from retained fluid or any difficulty arising during childbirth is to be treated exactly as in the case of marked uterus bicornis. If the vagina is involved, it may be necessary to take means to facilitate copulation, as in the case of Tauffer which Derner has reported:

Patient twenty-seven years old, healthy in childhood; menstruated at fourteen years, regularly, profusely, always with backache. Married ten years; six months ago was informed that the dribbling of urine after coitus was due to urethral cohabitation. Examination at that time showed that the two hidden vaginal introiti would just admit a catheter. They were dilated, first with a three-bladed dilatator, then for two to three days with Weiss's rectal speculum. The patient was then advised to let coitus be attempted by the proper channel. She soon conceived, but aborted at the fourth to fifth month. Since then has had pains in the left hypochondrium, and much discharge.

Status Præsens.—Mons fat; labia thin; clitoris normal. At place of urethral opening a nut-sized, reddish, cock's-comb-like tumor, the mucous membrane covering which has been transformed into an epidermis-like covering. (It is the detached lower wall of the urethra.) When this tumor is replaced we have a picture very like that of atresia hymenalis. We can see the two vaginal entrances, the left broader, the right just large enough to admit a finger.

Digital examination of left vagina shows a normal portio with broad orifice, and a goose-egg-size, anteflexed, tender uterine body, on the posterior wall of which is a sub-serous tumor. Right vagina shows portio with lentil-sized orifice, and a movable, non-sensitive, anteflexed uterus. the size of a hen's egg.

The urethra will admit the index finger. There is slight resistance at the sphincter, and the broad furrow between the two urethræ can be distinctly felt. Per rectum a membranous structure half an inch broad can be felt uniting the two cervices. Ovaries hyperæsthetic.

The vaginal septum is wedge-shaped; broad and muscular at the introitus, it becomes thin as paper higher up. Chronic vaginitis. No vesical incontinence.

CHAPTER XXXVI.

DEFICIENT DEVELOPMENT OF THE UTERUS.

(*Hypoplasia uteri.*)

PROBABLY the anatomical basis for this anomaly is not alike in all cases, since it shows itself in various forms. These forms simply represent the various stages at which the womb has ceased to develop.

Uterus fœtalis is but rarely found. As in the new-born child, the organ is small, and its longitudinal axis is only one-half or two-thirds the size of the normal womb. It is anvil-shaped; the cervix is disproportionately large, and the body is small and seems to be merely an appendix to the neck. Often it is bent forwards, so that the small relaxed body rests upon the anterior surface of the thick cervix. The internal os is indistinct; and the plicæ palmatæ are continued into the cavity of the uterine body.

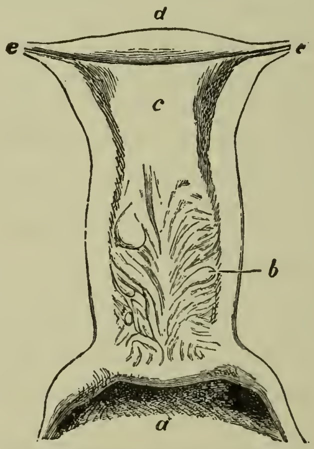

FIG. 46.—UTERUS FŒTALIS; SECTION IN NATURAL SIZE. *a*, Vagina; *b*, cervix and arbor vitæ; *c*, body; *d*, fundus; *e*, *e*, openings of Fallopian tubes. (After *Kussmaul.*)

In other cases the uterus is as small as in the fœtus, but the body is larger than the cervix, and the walls of the organ are very thin. This form has usually been called congenital atrophy; Virchow and S. v. Forster designate it congenital hypoplasia; Puesch calls it utérus pubescent. If the walls are very thin indeed, we have the uterus membranaceous.

In other cases the uterus is normal in shape, but is too small. The longitudinal axis is 1.6 to 2 inches; the walls are very thin, and the cervix is indicated by a barely perceptible groove. This form is called uterus infantalis by some, but it had better be designated by the term congenital smallness of the uterus.

But all these three abnormalities are only types of a series of forms of deficient uterine development, which is best called hypoplasia uteri. Many transition forms between the above types have been recorded; and there are similar transition types downwards to the rudimentary, and upwards to the normal womb. One such interesting case has been recorded by Duplay.

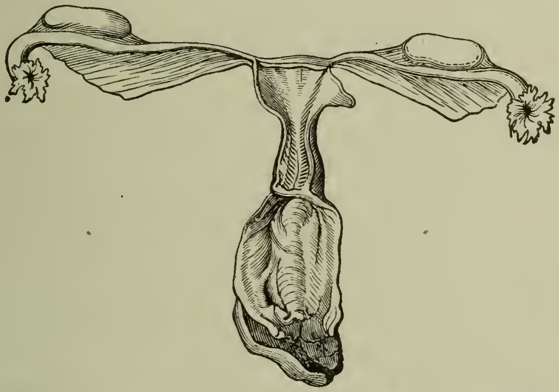

Fig. 47.—Primary Atrophy of the Uterus. (After *Virchow.*)

He found a small uterus, cervix eighteen lines long, body only half an inch long and sixteen lines broad. At first sight the womb appeared to be all neck. The body was solid, but the cervix had a narrow cavity one and a half inches long, blind above, and opening below into the vagina by a narrow orifice. The walls of the cavity were united to one another by delicate threads; and the inner surface of the canal was of a yellow color, such as is seen in old apoplectic foci. The oviducts were solid fibrous cords.

As to the transition stages to the normal size, many of the cases of anteflexio uteri met at puberty, are cases where the organ is too small and its walls are too thin. We cannot, therefore, make too sharp a distinction. But if the cervix is larger than the corpus uteri; if the longitudinal axis is less than two inches; and if the walls are thin and membranous, I would include the organ in this category. One or all of these factors may be present. If they all are, we have the well-marked uterus fœtalis; while mere thinness of the walls forms the least degree of the anomaly.

The deficient development may apply to the uterus alone; the rest of the genitals and the entire body being normally developed. But in most cases there are irregularities in the sexual or other organs, which are more or less closely related to the uterine anomaly. The tubes are rarely affected, but the ovaries often are. Absence, rudimentary condition, non-presence or defective development of the Graafian follicles, have been found as regards the ovaries, in connection with hypoplasia uteri.

The vagina is usually normal; abnormal narrowness and shortness is uncommon; and the same is true of the external genitals and the breasts.

The pelvis is sometimes small and childlike, and sometimes masculine, but it may be quite natural. The entire body may vary from dwarf-size to the natural stature.

The rule is that the less the degree of the anomaly, the less are the associated changes. But there are exceptions. With the highest grades of hypoplasia the ovaries may be normal, and the bodily structure large and vigorous.

The causes of hypoplasia uteri can only come into action when the organ has been completely formed, in the last months of pregnancy, and after the twenty-fourth week. But the uterus attains its fully developed form late, and injurious influences affecting the organ after birth, during childhood, or even at puberty, may cause the deformity. It cannot, therefore, be called purely congenital.

As to the real causes, we are by no means entirely clear. Where the rest of the body is normal, the causes must be purely local; perhaps nutritive disturbances play here a *rôle* similar to their part in the causation of deformities of the womb. V. Recklinghausen's case shows that inflammatory action in the neighborhood of the uterus may cause it to remain stationary at a very low stage of development. He found a uterus fœtalis which was bound down by pseudo-membranous adhesions to the posterior vesical wall, and thus hindered in its development.

In other cases the absence or rudimentary formation of the ovaries may exist, and the absence of the sexual influence of these organs may prevent uterine growth.

In the case of dwarfs, the hypoplasia of the uterus may be a part of the general defective growth, or it may be dependent upon deficient development of the ovaries. I have repeatedly exhibited to the clinic in recent years an individual of this kind forty years old. She only began to menstruate at twenty-three; and the function was weak and irregular, often remaining absent for years. Anæmic symptoms, heart normal. Vagina narrow and smooth; os a little groove; uterus 2.4 inches long, but membranous, movable to all sides. Ovaries very small and smooth, the left somewhat irregular.

Cretinism also causes the affection, which is then not uncommonly found in connection with a child's pelvis. Scrofula and rickets also may cause it, but the frequency with which women who have most marked malformation from the latter disease, do conceive and bear children, would speak against the latter cause.

Certain nervous diseases, epilepsy and hysteria, are spoken of as causes, but perhaps the connection is accidental or the nervous affections are consecutive.

But chlorosis plays an important part in connection with hyperplasia uteri. While we formerly believed that the deficient genital development was primary, and caused the chlorosis, we are now inclining to Virchow's opinion, that it is the chlorosis that hinders the genitals developing into the full virginal form. Especially is this the case when the chlorosis is dependent upon congenital smallness of the heart, and congenital narrowness of the great arteries (aorta). But, as E. Fränckel has proven, there very certainly are cases where the uterus fœtalis has originated in cases that were effective during embryonal or early child life, while chlorosis only appeared later at puberty. And in other cases, after the anomaly has lessened, and the walls of the uterus have become stronger, the anæmic symptoms have improved; so that we must regard hypoplasia uteri as an occasional cause of chlorosis.

But in most cases it is quite impossible to decide which is the primary, and which the secondary affection. As a rule an examination is only made after the chlorosis has existed for some time, and we find ourselves unable to decide whether the hypoplasia uteri is cause or effect. Nor is the defective uterine development always so great that a conscientious and skilled observer can venture to decide that it is the etiological moment of the malady. It needs be said, of course, that chlorosis occurs with entirely normal uteri.

Hypoplasia uteri may also be found with early tuberculosis.

As to the symptomatology. If the individual is otherwise well developed, and the anomaly is confined to the uterus, or the uterus and ovaries, the symptoms will only appear at puberty. Menstruation does not occur; and even in later life, complete amenorrhœa without any other trouble is not uncommon. But there are usually moliminal symptoms; mucus flows from the genitals, accompanied with periodical abdominal pains or true dysmenorrhoic troubles. Or there may be cyclic congestions or disturbances of other organs, abdominal pains, vomiting, diarrhœa, palpitation, pains in head and loins, etc. Vicarious hemorrhages from nose, lung, rectum, etc., have also, though rarely been observed. Yet cases have been recorded in which there was a true menstruation, though it was scanty and irregular. If the uterus approaches the normal standard the menses will be scanty, and dysmenorrhoic symptoms will be present. In very rare instances there is an abundant monthly flow.

The sexual impulse is absent or very weak, but not always so.

Thus I treated a woman forty years old, and who had been married for several years, for a profuse vaginal blenorrhœa. She was very strongly built, markedly female in habitus; yet her uterus was only 1.8 inches long, and her ovaries were imperceptible. She had never menstruated, and sexual desire was very weak indeed.

I have also many times examined another woman twenty-eight years old, married several years. She is of medium size, female habitus; breasts, external genitals and vagina normal. Uterus 1.6 inches long only, walls very thin, ovaries imperceptible. Has only had a few weak faint signs of menses; yet the sexual impulse is very strongly developed indeed. She has a vaginal blenorrhœa, and has been concerned in scandalous actions, has broken her marital vows, and has surrendered herself to the most various sexual excesses.

Sterility in the higher grades of the anomaly always occurs with amenorrhœa, but the condition of the ovaries is certainly as much responsible for that as the state of the uterus. Even in the more fully developed womb conception is the exception. If it does occur, abortion is very liable to happen; the danger of rupture of the uterus is a theoretical, but hardly a practical conclusion.

The symptoms of hypoplasia will vary in accordance with the malady that causes it. This is especially the case in chlorosis. In the less marked forms of course they will be less severe.

There is a good deal of evidence to show that the lesser forms of hypoplasia are capable of cure; that after long stasis the growth of the uterus can begin again, and the organ attain a normal size.

Thus we see not infrequently that chlorotic girls with poorly developed uteri, after years of suffering and amenorrhœa, may go on to menstruate and conceive. But we must deny that well-marked forms, like uterus fœtalis and infantalis, where the ovaries also are frequently atrophied, can recover. The reported cases where in a short space of time such uteri have increased an inch or more in size are certainly erroneous in their measurements. Here the frequent anteflexion of the uterus plays a part; and the pathological thickening of the walls consequent upon lengthy local treatment may also have its effect.

Nor must we forget that a hypoplastic uterus may become impregnated, and thus attain the normal shape and size. This is seen in Pfau's case:

A girl had an occluded vagina with an imperfectly developed uterus. When seventeen years old the tendinous hymen was split, and the accumulated menstrual blood evacuated Three months later menstruation began with very severe pain; and in spite of all treatment continued with almost unbearable severity until her twentieth year, when she married. Coitus was very painful, and she was examined. The external genitals were normal, the smooth vagina before mentioned one and a half inches long. Instead of the portio vaginalis was a warty elevation the size of a bean, in which was a small opening into which the sound could hardly be passed half an inch. Examination per anum showed that the entire womb was deficiently developed, it being barely one and three quarter inches long. There was thus little chance of her becoming pregnant. During the next two years menstruation, though yet painful, became more abundant, but the cervix did not change. Nevertheless the sudden cessation of the menses looked like a pregnancy, and on October 13th, 1844, three years after marriage, symptoms of labor set in. The head could be felt at the pelvic entrance, but the os could not be found. After four days Pfau was about to cut, but he found that he could bore his finger through the tendinous moss-like tissue which occluded the cervix. Delivery was completed through the cervix. The child lived. Four months later the menses reappeared, and were painless. The vagina was now of normal size, the portio one quarter inch long, forming a slit.

The diagnosis of the affection is not difficult, at all events in the well-marked forms. Amenorrhœa or scanty menstruation directs our attention to the internal genitals. Occasionally also we see atrophy of the external genitals, small-sized vagina, small cervix and os, all of which point to defective development of the rest of the genital tract. But I must remark that the condition of the cervix, which has not quite properly been designated uterus parvicollis and acollis, occurs also with the normal womb; and that the normal cervix of the normal uterus may for various reasons disappear in the vaginal vault. By bi-manual examination (per vaginam or per rectum) the practised hand can decide upon the size and shape of the womb, especially when the external conditions, relaxation of the abdominal walls, etc., are favorable. But the sound must be introduced to make a positive diagnosis. This is often difficult on account of the small size of the cervical cavity. Hypoplasia is present if the uterine cavity is less than two inches long. But we must not forget that the body of the womb is often anteflexed, and the sound may penetrate only to the internal os. It is well, therefore, to again make a bi-manual examination, leaving the sound *in situ*. The womb may be pressed forwards, or backwards against the rectum, and so felt. Even if the sound passes 2.2 to 2.4 inches in, hypoplasia may be present, and the walls may be thin and membranous. The distinctness with which we can feel the head of the sound, will give us information upon that point. By bi-manual examination we would also appreciate the extreme flatness of the organ, when its walls are very thin.

But it must be conceded that for an exact examination into the condition of the womb it is necessary to have some skill and experience in gynecological examinations.

The chief danger is of confounding the condition with uterus unicornis. For it would be the lateral implantation of the vaginal portion in the vault, the lateral position and the corresponding curvature of the uterus, the pointed fundus, and, not infrequently, the proof of the existence of a subsidiary cornu. On the other hand, a central and perpendicular position, a round fundus, and the absence of any subsidiary horn would speak for the simple womb.

The treatment of hypoplasia uteri depends not only upon the grade of the abnormality, but also upon the condition of the ovaries and the general constitution.

When the patient is robust, the general health good, and no local disturbances present, it will be best to avoid any action. If there are dysmenorrhoic symptoms, and the menses are absent or scanty, the mode of treatment depends primarily upon the condition of the ovaries and the uterus. If the ovaries are not atrophied, and if the womb is not too backward, we may attempt to establish the menses by local irritants (leeches, scarification, hot-water injections, cold douches, sounds, intrauterine pessaries, electricity, etc.). But if the ovaries are rudimentary, and the uterus fœtal, it will hardly be possible to accomplish anything in this way; we can only deal with the symptoms. But if the dysmenorrhoic symptoms are very marked, and local treatment is useless, we may think of castration. Hegar has done so (as he has told me), though with but little effect, but Bruggisser has removed the enlarged ovaries in a uterus infantilis 1.2 inches long, belonging to an amenorrhoic girl of twenty-one years, with the best result.

When chlorosis occurs in connection with the malady, a roborant treatment and diet (suitable nourishment and drink, change of climate, tonics and iron) are in order; and often render the local treatment unnecessary, which may be so disagreeable at the time of puberty. There is no doubt that when the abnormality is not very marked, the normal function of the uterus may be re-established in this way. In married women, where our main idea is often to overcome the sterility, the local treatment will be the chief thing. Nevertheless we must warn our readers against too extensive and long-continued local treatment of anæmic and nervous persons.

Kussmaul, in his book upon deficiency of the uterus, questions whether the uterine wall may be thin and deficient at one part,—say the fundus,—while the rest of the organ is normal. He says he cannot decide this very important question, since he has never met any such case. It is true that the older recorded cases, in which rupture of the uterus is said to have occurred in consequence of such an abnormality, are not quite satisfactory; but experience, which shows that pregnancy and childbirth may occur when the uterine walls are thin *in toto,* is not opposed to it.

As Lachapelle and Wiegand have claimed, it is not infrequently seen that in women who have borne many children in rapid succession, and whose abdominal walls are thin, the fœtus seems to lie immediately under the abdominal walls, so plainly can they be seen and felt. It appears as if the walls of the womb cannot be thicker than a sheet of paper. But this appearance is due rather to the relaxation and softening than to the thinness of the uterine walls. For these uteri do not seem to be smaller than others *post partum;* and it must have had the ordinary volume during pregnancy. The same thing occurs in the normal womb when examined with the sound. The consistency, and not the size of the walls, is the determining factor.

Nevertheless, abnormal thinness of the walls of the womb does exist, though not to the degree which the above-named authors would have it. For it is not very infrequent to find at the autopsies of women dead shortly after confinement, that the muscular structures are not distributed in the ordinary way. Instead of the walls gradually becoming thicker from the internal os to the fundus, or at all events remaining of the same size, the fundus is decidedly thinner than the parts around the os internum. And even more frequently we can recognize partial defects of the uterine walls in the living subject and during pregnancy. Not infrequently we find every thing normal, save that one or other cornu (if we may so designate the neighborhood of the tubal mouths in the normal womb) is swollen like a bladder. Here the walls are thin, and the child's parts can be more easily felt than elsewhere. When uterine contraction occurs, the defect can be still more plainly felt; the contracting organ drives the fluid into the thin cornu, which then becomes more cystic in appearance than ever. This deficient development is not infrequent; and attention once directed to it, is not infrequently found in pregnant women. It cannot be explained otherwise than as a local thinness; the rest of the organ is of normal consistency; and it is found in primiparæ, in whom there is none of that loosening, etc., of tissue which is found after many successive pregnancies. Nor can it be due to a partial contraction of the circular muscles around the tubal mouths, as sometimes occurs after delivery; for there would have to be at that time a corresponding depression, and the spasm would have to be a permanent one.

We cannot tell the cause of this defect. It is remarkable that it always affects the upper angles of the womb where the tubes and round ligaments are inserted; and it is not infrequently found together with a slight depression of the fundus uteri. Both these facts show that the condition is connected with that of the uterus arcuatus. This partial thinning must be connected with the rudimentary formation of one cornu, as is the case with the other double formations.

What the influence of the abnormality is upon pregnancy and childbirth is not decided. I have had occasion in an exquisitely marked case not only to confirm its existence by internal examination, but to appreciate its serious consequences.

In a primipara twenty-eight years old, the uterus contracted firmly during the pains, while the right cornu became distended like a bladder the size of a man's fist. I was compelled to terminate the labor with forceps. Hemorrhage then set in, and I had to introduce my hand into the womb to remove the placenta. Here I could feel the abnormal partial thinning, as if the organ had been ruptured. The placenta was partly implanted upon the thinned area. It required injection of liq. ferri sesquichlorati to stop the hemorrhage.

There is not the slightest doubt that the thinned spot could not close the mouths of the vessels on account of the deficiency in muscular tissue. And it is undoubtedly quite possible for such a spot to be the seat of rupture.

CHAPTER XXXVII.

SLIGHTER DEVELOPMENTAL ANOMALIES OF THE UTERUS.

I. Obliquity of the Uterus.

OBLIQUITAS uteri quoad formam is an anomaly closely related to those we have just been considering. The longitudinal axis of the womb is not coincident with that of the pelvis, so that the vaginal portion deviates to one and the fundus deviates to the other side, together with defective development of one half of the womb. One side and one cornu are less than the other side and the other cornu. Thus the uterus is apparently displaced upon its vertical axis.

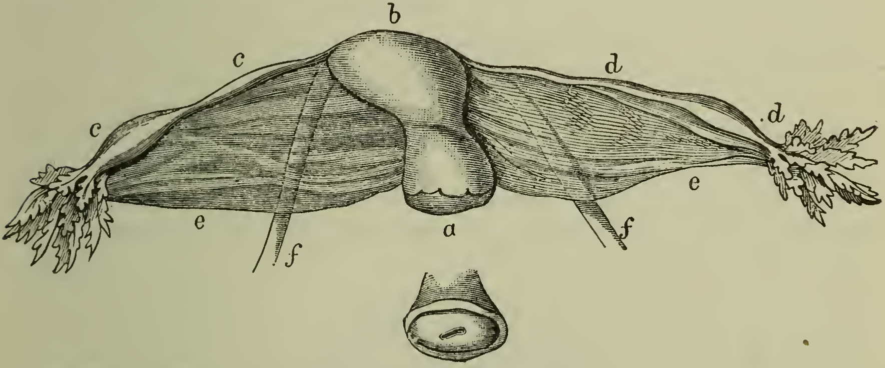

Fig. 48.—Obliquity of the Uterus. (After *Tiedemann.*) *a*, *b*, The uterus strongly flexed to the right; *c*, *d*, tubes; *e*, *e*, lig. lata.; *f*, *f*, lig. rotunda.

There is in quite a number of cases no other explanation possible than that one Müllerian duct has been insufficiently developed, without, however, being prevented from uniting with the opposite duct. Perhaps also an unsymmetrical position of the two halves may have something to do with it; one duct may be situated lower than the other, and thus asymmetry ensue when the two halves unite. The cause may either be in the uterus itself, or it may come from without. One ligamentum latum may be too short, as indeed Kussmaul found in a case of obliquity of the uterus in a new-born infant. Fœtal inflammations, and abnormal growth and size of neighboring organs, bladder and rectum, may not unlikely be influential factors also.

Deficient development of one half of the organ is almost always marked by obliquity. This condition is the transition stage to latero-flexion, where the body is bent upon the cervix, or body and cervix together are bent. Most often a fault in the uterine rudiments or inflammatory shortening of the broad and round ligaments will be the active causes.

Sterility not infrequently occurs with obliquity of this kind, and probably the bending of the organ has more to do with it than any partial deficient development. The obliquity seen in the highly gravid uterus probably depends upon slight original obliquity of this kind, heightened and increased by the great mobility of the organ of conception at that time. On the other hand, the results ascribed to the obliquity of the uterus are really due to other causes. Nevertheless, it is not impossible that the changes of the lower segment of the uterus, *inter graviditatem*, in latero-position, may occur here.

The anomaly could be mistaken during life for a uterus unicornis on account of the lateral implantation of the vaginal portion and the oblique position of the womb. But the well-developed uterine body, and the lig. rotunda, tubes, and ovaries present on both sides, ought to render diagnosis easy. The only treatment that may possibly be necessary is the mechanical means for the relief of the sterility and the dysmenorrhœa.

I have recently had an opportunity to demonstrate in the clinic here a case of this kind during labor, and in a primiparous woman. The head was deep down in the pelvis, and the cervix was widely dilated. The more developed half was markedly deflected to the right, so that the somewhat cystic and dilated cornu reached almost to the kidney region. The atrophied side projected only a hand's breadth beyond the median line; its cornu was more deeply seated and turned anteriorly, so that its round ligament could be very plainly recognized. The fundus showed a slight depression. Labor was normal, save for a slight perineal rupture, but after delivery very little of the original form of the uterus could be recognized.

If the unilateral atrophy and bending is but little marked, we can regard the case as one of simple latero-version of the uterus; a condition which probably occurs in a similar manner to the corresponding flexion.

II. Congenital Latero-position of the Uterus.

This is much more common than the former uterine anomaly, and should not properly be recognized among the malformations. The shape of the womb is normal; its vertical diameter runs parallel to the pelvic axis, but the entire organ is displaced sidewards. Most commonly it is approximated to the left side. Unequal lengths of the broad ligaments. and, as L. Meyer has proven from the bodies of new-born infants, of the ovarian ligaments also, are the cause of the abnormality. It is somewhat doubtful if a defective development of the corresponding vaginal wall has anything to do with it. The latero-position of the womb displaces Douglas's *cul-de-sac*. The ovaries are displaced upwards or downwards; which may be of importance, since the pedicle of a possible ovarian tumor will be very short or absent on the side of the shortened ligament, while on the other side it will be very long. The portio vaginalis is of course correspondingly dislocated.

It is doubtful if the anomaly is a frequent cause of sterility, but it may cause characteristic changes in the lower segment of the uterus, during the latter stages of pregnancy The advancing head depresses the anterior vaginal vault to one side; and the portio is driven sidewards instead of backwards. But the dilating os soon reassumes its normal position in the centre of the pelvis.

The anomaly is easily recognized. The lateral position of the cervix in the vaginal vault points to it; and with bi-manual examination and the sound, latero-position is made out. No treatment is necessary.

III. The Double-Mouthed Uterus.

(*Uterus biforis.*)

By this we mean a uterus with single body and cervix, but with the external os divided into two parts by an antero-posterior partition. These openings may or may not be of equal size. In some cases the position extends upwards a certain distance, so that we can speak of a uterus bicollis.

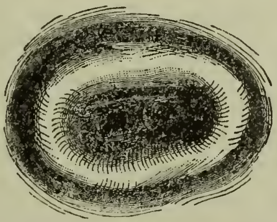

Fig. 49.—Double Os Uteri. (After *Heitzmann.*)

This anomaly, which is normal in the ant-eaters, is to be regarded as the lowest grade of uterine duplexity; the partition at the os being the last remnant of the original genital septum. It is difficult to say why it sometimes persists just here.

It may cause trouble during delivery. The presenting part may dilate one opening, and push the septum aside, but sometimes the septum is torn through. Winckel had such a case, which he called uterus infraseptus, in which the prematurely born fœtus tore through the partition. Mebus relates a case in a primipara, in which both openings were strongly dilated by the cervix, so that the large fontanelle was found at the one, and the small at the other opening. When torn, these bands may cause considerable hemorrhage, and may form the starting-place for infective processes *in puerperio.*

Recognition of the anomaly is not difficult; simple vaginal examination will reveal it. But during delivery one os only may be dilated, and the other escape notice. If by finger or two sounds we can recognize that both orifices open into the same cervical cavity, the diagnosis is made. In uterus bilocularis the sounds would not meet until they reach the fundus; and in uterus bicornis the external form of the womb is different.

It is only of obstetric interest. It may be necessary to push the dividing band to one side, or, if that cannot be done, to double ligature and cut them, exactly as is done with vaginal bands.

IV. Abnormal Plication of the Cervical Cavity.

This is a peculiar developmental defect of the cervix, in which instead of the normal arbor vitæ, a broad thick fold projects into the lumen of the canal, giving the impression of a second vaginal portion filling the cavity of the cervix. (See accompanying illustration.) I have had occasion to see a case of the kind.

In a girl twenty years old, with normal external genitals and vagina, the uterus could be felt to be slightly retroflexed through the wall of the posterior vaginal vault; and a soft fleshy mass could be felt in the cervical cavity in the same way. After the cervix had been dilated with a laminaria tent, a structure was found inside so like a dilated portio vaginalis, that there seemed to be a second cervix. Evidently here was a repetition of the vaginal portion higher up in the cervical canal.

A microscopic examination of a part excised during life showed that it contained all the elements of the cervix in proper order, muscle bundles, connective tissue, glands, and epithelium. And there were no signs of chronic nutritive disturbances, no granulation tissue.

The deformity is rare, and has not yet been described. I will add a few observations which my predecessor Breisky has noted in the clinical records at Berne.

A woman, forty years old; one child eight years before; vaginal portion relaxed, thin, .6 of an inch long, os and cervical canal admit two fingers. In the region of the internal os is a prominent, circularly attached tumor projecting into the cervical canal. Its surface is rough, and there is a small opening in its middle, into which the tip of the finger can be passed. After dilating this with laminaria, we found the mucous membrane covering the ring perfectly smooth, and the internal os open to the finger tip. Uterus 3.6 inches long, 2.8 inches of it being above the pathological orifice.

In both cases menstruation appeared early, and was profuse; and both women sought assistance for the hemorrhage.

It is hard to decide as to the etiology of this undoubted developmental fault. We may note that it is very like the form which occurs normally in the sheep.

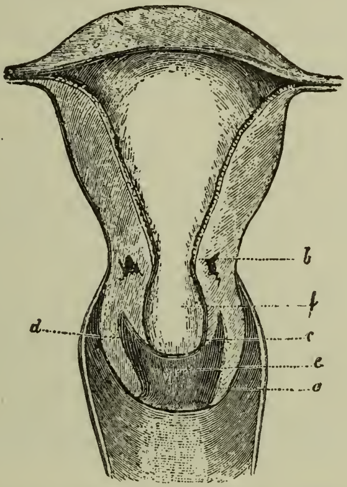

FIG. 50.—ABNORMAL PLICATION OF THE CERVICAL CAVITY. (After *P. Müller.*) *a*, Os externum; *b*, os internum; *c*, *d*, abnormal plication; *e*,*f*, cervical cavity.

It is also of practical importance, apparently causing the same profuse hemorrhages as do polypoid growths, to be relieved by ablation of the fold. It may also disturb delivery. Thus E. Bidder reports as follows:

In a primipara twenty-six years old, the cervix was funnel-shaped. Its canal was divided by a semilunar-shaped fold nearer the internal os, into an upper and a lower pocket. Neither the bag of waters nor the head could dilate this fold. Chills and fever set in; two incisions were made in the fold and the cervix, and the forceps applied. The patient had fever from the third to fifth day from colpitis and endometritis colli. The cervical fold seemed to be entirely destroyed, and did not form again.

The hemorrhage will necessitate an examination of the inner uterine surface. We will find a perforated ring in the cervical canal, which on closer examination will be found to be exactly like a second cervix.

A speedy ablation of the membrane is indicated. During labor, incisions, such as Bidder made, will remove the obstacle.

V. ABNORMAL COMMUNICATIONS WITH THE UTERUS.

The uterus may open into the cloaca; this has been seen in the newborn, but not in adults. Thus, J. F. A. Wolff describes a case in which the double uterus opened by a vagina duplex into the common excretory duct of the genital, intestinal, and urinary passages.

More frequently observed are communications between the uterus and the urinary organs, especially as a combination of abdominal, vesical and symphyseal fissure. Most often it is in dead-born infants, but it has been often seen in adults; the connection with the misshapen urinary organs being by means of a short vagina. In spite of the malformation, conception may set in, but abortion easily occurs. This is supposed to be because the uterus, deprived of its supports, sinks down into the vagina, and thus by tension upon the lower segment of the womb awakens uterine contractions. It is almost always necessary to employ artificial means for delivery. The diagnosis is easy on account of the superficial nature of the anomaly.

Dyhrenfurth has described a peculiar case:

In a girl twenty-two years old, who had menstruated regularly for six years, cohabitation could not be effected. The vagina was found closed, the uterus rudimentary. Menstrual blood flowed per urethram. On dilating the urethra, no connection with the uterus was found; and the cherry-sized uterus rendered it probable that there was a true vicarious menstruation.

Communications of the uterus with the rectum are much rarer. In birds the genital canal normally opens into the rectum. Conception may occur here, in spite of the closure of the external genitals. The cases of Rossi and Louis are well known, and have often been cited.

In Rossi's case the rectum communicated with the vagina by a little opening above the sphincter ani. The vagina itself was closed save for a fine canal. Impregnation took place per rectum. Delivery was effected at term by division of the septum occluding the vagina. The woman later conceived again through the artificial vagina.

In Louis's case the external genitals were closed; menstruation was per rectum; cohabitation per anum. Conception occurred, and the child was delivered by the rectum.

Rectal examination is called for, and will immediately reveal the true state of affairs.

The treatment during delivery is that which Rossi practised, especially when the recto-vaginal opening is small.

We must mention an extremely interesting case observed at the surgical clinic at Kiel, and described by H. Becker as a case of "atresia ani uterina."

The external genitals of a new-born child showed only a single opening for the urethra; the anus was imperforate. While operating for this a sac was reached 1.4 inches up, which was supposed to be the rectum; a small amount of turbid fluid was evacuated. A few days later an autopsy was held. There was a double uterus, the single vagina of which opened into the urethra. The right uterine cavity was closed to the vagina. The left had not only an opening into the vagina, but also a short canal leading to the rectum, which ended high up in the pelvis. The left half of the uterus had been opened in place of the rectum.

Only two similar cases are recorded: Bednar's and Vallisnieri's. In the first the rectum communicated with a simple, in the latter with a duplex uterus.

VI. PREMATURE UTERINE DEVELOPMENT.

Not only the uterus, but the other internal and external genitals and the breasts, may have during childhood the size and shape proper only to maturer years. The general system may or may not correspond to the anomalous development.

Sometimes excessive growth begins to manifest itself immediately after birth. The mental development may be excessive, normal, or deficient.

The hyperplasia of the uterus has been but very seldom demonstrated directly, on account of the difficulties in the way of an internal examination in children.

It is remarkable that no one has attempted to make a rectal examination in menstruatio præcox.

We conclude that the anomaly exists from certain symptoms, especially menstruatio præcox. But the symptoms may lead us into error. Premature growth of the entire body by no means necessarily means excessive growth of the womb. Even excessive growth of the external genitals does not prove it; for Cooke has seen an autopsy on a girl four years old, whose external genitals were those of puberty, yet whose uterus and ovaries were childlike. Nor must genital hemorrhages, especially when not quite regular, be immediately received as menses. That is only the case when they are regular, last several days, and no other disease is present. We can only attain certainty by local examination, an autopsy, or pregnancy. No local examination seems yet to have been made, and there have been but very few autopsies that are reliable. Thus Campbell mentions a case in which a girl menstruated from birth every three weeks. She died at four years; and the autopsy showed that the sexual organs were unusually developed. Prochownik has recently reported the following very interesting case:

A very rachitic and scrofulous child had had regular hemorrhages every four weeks, lasting two to three days, since its first year. Two days after cessation of a hemorrhage the child died of miliary tuberculosis. The autopsy showed a normal and proper general development; the breasts were moderately and the external genitals more strongly developed and hairy. The uterus was that of a child approaching puberty, not one three years old. The internal surface of the organ looked as if menstruation had just ceased from it. The ovaries were infantile in size, but as large as those of a ten year old girl. The follicles were developed, a corpus luteum and scars were present; they undoubtedly functionated as in the adult.

Pregnancy is a still better proof. The ripening of follicles, conception, and the reception and growth of the ovum demand adult organs. Such cases have been observed, though but rarely. I will mention one very reliable case from among the older records.

Anna Mummenthaler died at Trachselwald in Berne on the 11th of January 1816, seventy-five years old. Even at birth she was excessively developed; at her second year she menstruated regularly, and continued to do so till fifty-two years old. When eight years old her uncle impregnated her, and fled. Nine months later she was instrumentally delivered by Dr. Brown. The child was dead, and was an ell long. She ceased growing after her eighth year. All these things are well known, and are proven.[1]

Dr. Rowlett of Kentucky reports a case of puberty and pregnancy in a girl of ten; and H. Bodd a girl who menstruated irregularly after her first, and regularly after her seventh year, and who had a child at eight years and ten and a half months.

Sally Deveese was born on April 7th, 1824. She was of normal size. But a few weeks after birth her hips and breasts began to grow rapidly. In her twelfth month menses appeared, and her hips and breasts were so large as to excite universal attention. In 1833 she became pregnant, and on April 20th, 1834, was delivered of a healthy girl weighing seven and three quarter pounds. Thus at the age of ten years and thirteen days, she became the mother of a child of ordinary size. It refused the breast, and had to be raised on the bottle. It was healthy. The mother was four feet seven inches high, and weighed one hundred pounds; her appearance and understanding is that of a girl of her age. She was the fifteenth child of her mother, who bore her at forty-five years. No other such case has occurred on either side of her family.

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[1] Archiv. der Medicin, Chirurgie und Pharm. Von einer Gesellschaft Schweizer Aerzte. Aarau, 1816, 2nd part, p. 39.

More recently (1878) Molitor has reported a case of maturity at eight years.

Child was born with hair on the pubis. At fourth year the periods appeared regularly, and the entire body developed as at puberty. At eight years and three months she became pregnant; and at the fifth month gave birth to a fœtus corresponding in size to the third month of pregnancy.

Hence it seems that the facultas gestandi and the facultas concipiendi do not always coincide.

We know nothing certain as to the real origin of premature sexual development. High grade of maternal productivity and dyscrasic diseases in the children have been cited, but in most cases there is no basis for any theory whatsoever.

The Menopause.

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THE MENOPAUSE.

CHAPTER I.

GENERAL CONSIDERATIONS.

THE climacteric, or so-called "change of life" in woman, presents, without question, one of the most interesting subjects offered to the physician, and especially to the gynecologist, in the practice of his profession. The phenomena of this period are so various and changeable, that he must certainly have had a wide experience who has observed and learned to estimate them all. So ill-defined are the boundaries between the physiological and the pathological in this field of study, that it is highly desirable in the interests of our patients of the other sex, that the greatest possible light should be thrown upon this question.

In undertaking in the following pages to investigate anew this important subject, and to report a series of striking clinical observations (with an occasional reference to some view regarding the nature of this period which has particularly impressed me), I hope that I shall contribute in some degree to the advancement of our knowledge in this direction, and that I may possibly incite others to continue the work in this field.

By the "change of life" we understand that phase in the life of a woman in which her sexual activity ceases. In determining the time at which this period begins and ends we usually rely upon the most striking sign, the sudden or more gradual cessation of menstruation; we say in a given case that a woman has entered upon the climacteric when, after reaching a comparatively advanced age, her previously regular periods begin to be irregular, and we say that she has reached the climacteric as long as these irregularities continue, and we infer that she has passed the change of life when menstruation ceases permanently.

With reference to the particular age at which the change usually occurs, I have numerous statistics that have been elaborated with commendable industry, but it is not my purpose to dilate upon these. Without doubt the change occurs later in Northern people than in those of the South. In our regions the average age is between forty-five and fifty.

What this variation is in certain zones I shall shortly demonstrate on the authority of some recent publications, which have not been utilized by former writers on this subject. A. Queirel and J. Rouvier found that in the vicinity of Marseilles the average age at which menstruation ceases is forty-six years and eleven and one half months. Goth states that among the seven different tribes of Transylvania the time at which the menopause occurs varies from thirty-nine to fifty-one years; on the other hand, Rodsewitsch reports that at St. Petersburg the average time is forty-eight years and eight and three-quarter months, while in Moscow (on the authority of Bensenger) it falls between forty-three and forty-eight. Of course isolated cases occur everywhere in which the menopause is delayed until much later than the average time in the given region. In looking through the literature we observe every possible variation. For example, in order to select an extreme instance from those now before me, Brièrre de Boismont observed two cases and Courty one, in which menstruation ceased at twenty-one, while Hegar recalls a case (mentioned in Battey's "Normal Ovariotomy") in which the periods continued to recur until the extreme age of ninety-three, the woman enjoying good health. Blancard and Langgland even report cases of persistent menstruation in women one hundred and six years of age. But, aside from such remarkably exceptional cases, in my opinion we cannot insist too strongly upon the necessity of the attending physician ascertaining the cause of the slightest deviations from the normal in this direction.

Still, hereditary peculiarities, or perhaps unknown disturbing influences, are sometimes to be held responsible for the premature or delayed appearance of the menopause, but we can sometimes find no possible explanation, and must be content with accepting it as a so-called "freak of Nature;" but the accurate observer will generally reduce such cases to a minimum, and the variations hitherto recorded will be shown to be comparatively few in number. In by far the larger number of abnormal cases it will be found that some pathological process was the cause, and I make it a rule from the outset to search for such a process in every case of this kind. To digress slightly, Scanzoni, whose opportunities for clinical observation were so great, mentions a woman aged fifty-three, as the oldest whose hemorrhages he was "inclined" to regard as really of a menstrual character; in every instance above this limit he was able to find, either in the living subject or after death, some pathological factor to account for the hemorrhage. I myself, who have recently given some attention to the subject, can add only one case in which the menses persisted after fifty-four without some discoverable cause.

We must always bear in mind certain general facts regarding the causes that influence the appearance of the climacteric, but these should never lull us into a feeling of security, and lead us to forget to make a rigid examination in any given case. Such causes, as we have already hinted, are climate, nature of the soil, elevation of place of habitation, race, mode of life, social relations, and the early or late establishment of the menses in the individual case; thus Schlichting says that menstruation begins earlier in the women of Berlin than in those of Munich, which is about 1600 feet lower than the former city, and Goth finds menstruation begins among the Germans inhabiting Transylvania at the same time as it does among the former dwellers in that country who now live on the Rhine. The latter also says that in all countries the Jews show the same tendency to early establishment of the menses, while among both Jews and Roumanians the early appearance of the menopause was striking.

Excessive sexual activity, especially numerous and rapidly succeeding pregnancies, leading to "premature marasmus of the woman" (Scanzoni), favor early appearance of the menopause. According to Kisch the sexual function is generally abolished earlier "in the laboring class, who are compelled to work hard and have many cares." Krieger decides, from observations of Mayer's, with regard to social status, that in women of the lower ranks the menopause occurs earlier than in the well-to-do and rich. As regards the time at which menstruation begins, it has been shown by Krieger, Kisch and others, that the earlier the menses appear, the later they cease and *vice versa;* however, when the first period is unusually early or late, the change of life comes very early. Some (as Tilt) think differently, while others (as Queirel and Rouvier) affirm that the time of appearance of the menses has no marked influence on the time of the menopause.

My own experience is that it is often difficult to establish the above-mentioned causal relation between the time of establishment and the cessation of the menses, because the exceptions are so numerous, and the causes of the variation in this or that direction in individual cases play such an important part. But we can depend upon a certain law, *viz.*, that there is a certain limit to the sexual activity of the normal female. Other things being equal, it is self-evident that in the perfectly healthy woman this "normal time" for the beginning of menstruation corresponds with the "normal time" for the cessation of sexual activity. If we describe the former as "early" which we are justified in doing, considering the relatively late beginning of menstruation in many abnormal cases, and the latter as "late" (in comparison with the premature development of the menopause in many abnormal cases), it certainly follows that there is some connection between the early appearance and the late disappearance of the periods. Since this law depends more or less exclusively upon the normal condition of the organism, deviations from the same must be related to abnormalities of the organism, and here as in all other cases, the rules can hardly be established by the exceptions. Too early or too late establishment of the menstrual function can, in consequence of the abnormal condition that causes it, also be associated with premature menopause; but, as I and many others have had an opportunity of observing, in both instances the change is just as likely to occur at the proper time, or too late. In this sense I would understand Kisch's very interesting explanation of the "greater sexual vitality" which prevails in certain women, which in his opinion lies at the bottom of the relation above-mentioned, especially when abnormal conditions exist. This "increased vitality" may consist to some extent in an increase of the usual normal condition, and may really approach the abnormal. The author himself gives us some reason to think thus by confining this peculiarly to "certain women." It seems to me that the first principle is properly applied as a rule to the healthy female, every case of "increased vitality" being regarded as abnormal, or at least as a transition to the abnormal. We could certainly speak of greater vitality, as shown not only in premature menstruation and very late menopause, but also merely when the first period appears very early (the menopause being normal or premature), or in cases of very late climacteric alone. As regards the manner in which menstruation ceases, every possible variation is observed. The time of its appearance is delayed; the intervals become longer (six weeks to several months) or shorter (fourteen days). The flow continues longer, often during the entire intermenstrual period; there is seldom a diminution in the amount. Continuous and slight losses of blood often alternate. The quantity is often much larger than usual, and may amount to a perfect out-gush. Between the periods we again observe for some time insignificant hemorrhages. The amount of blood lost during the entire time of the climacteric is rarely less than during the early normal periods. The blood itself is often watery, or darker than usual, and is frequently mixed with a quantity of mucus. The condition described is the one commonly observed. Less often the periods cease suddenly, the patient suffering more or less, or (as I recently noted in some cases) the menstrual flow may gradually decrease, becoming less and less, until it finally ceases entirely. For example, a woman began to be irregular at forty-three, and continued so till she was forty-five, the menses at first recurring every three weeks, then every four, five, six weeks, then every three months, then every six, and finally they disappeared. The hemorrhage each time was less than it was at the preceding period. After the cessation there was moderate leucorrhœa and sweating, which continued for some time longer. Another peculiar form which has interested me, and which I have certainly encountered but rarely, is as follows: At about the age of forty, as far as I could estimate it, in perfectly normal women, the menses fail to appear on one or two occasions, and then recur quite regularly for several years, eventually ceasing at the usual time for the menopause, and in the usual manner. Finally, I may mention here that the sudden cessation of menstruation, of which we shall speak more at length, subsequently takes place, as before-mentioned, with more or less disturbance, although this is by no means absolutely necessary. Moreover, I have observed some women in whom the last period appeared at the usual time, and followed the normal course, and neither before nor after it was any disturbance of the general health noted. It by no means necessarily follows that some pathological process is always at the bottom of sudden cessation of menstruation.

It is clear from what has been said that the duration of this so-called period of the climacteric varies greatly. It may be extremely short, or may extend over years. It usually occupies from one to three years. The much longer period noted by some authors (Tilt et alii) in different cases always awakens the suspicion that there was present some latent local or general disease.

As regards the physiology of the menopause we do well, in my opinion, to adhere to Hegar's view that the uterus and vagina form the duct of a gland, the ovary. Disappearance of this gland results, as in similar processes in other glands, in disappearance of the duct also, just as at the formative period of the organism the development of the duct is related to that of the gland. When the ovaries are wanting, the uterus and tubes are absent or imperfectly developed. In case of absence or rudimentary development of one ovary, the corresponding cornu of the uterus is wanting or rudimentary. At the time of the menopause this disappearance of the gland, or atrophy of the ovary, takes place; it is accompanied by a more or less sudden cessation of menstruation, and a retrograde metamorphosis of the uterus, vagina, and external genitals. Atrophy of the ovaries occurs very gradually. Puech found in one case that the ovaries were of normal size three years after the establishment of the menopause. Kiwisch describes the structural changes in this gland as consisting on the one hand in an increase of the connective-tissue stroma from the periphery towards the centre, the gradual hypertrophy of which results in destruction of the epithelial elements, and on the other hand, the Graafian vesicles themselves undergo retrograde change, fatty degeneration leading to complete atrophy of the granular epithelium and consequent cystic transformation of the vesicle with contraction of its cavity, and new formation of young connective tissue, which latter finally increases to such an extent that the entire ovisac is transformed into a fibrous mass. In consequence of these microscopical changes, which, as has been stated, take place very slowly, according to the same author, the entire organ becomes harder and smaller, decreases in length and breadth, and its exterior becomes nodular. In old age the ovary shrinks to a "flat, fibro-vascular induration." Waldeyer in one instance found no ovisacs present four years after the cessation of the menses.

Since, in order not to digress too far, I can not enter more minutely into the much-discussed question of the relation between ovulation and menstruation, I must entirely omit a more extended consideration of the question as to whether the atrophy of the ovaries at the climacteric does or does not have an influence upon the cessation of menstruation. It should only be noted that at the menopause the before-mentioned disappearance of the functional activity of the ovarian gland is attended with a more or less rapid cessation of the periods, and that in view of this relation it is difficult for one to come to the conclusion that menstruation is independent of ovulation; this is especially true when we consider also the effect upon menstruation produced by entire extirpation, or general disease of the ovaries, or recall the fact that menstruation has never been observed in cases where the ovaries were originally absent or imperfectly developed. (Puech.) However, it might of course be quite different, and both the phenomena of ovarian atrophy and of cessation of the menses at the climacteric, might be the more or less simultaneous consequences of a third factor, to which we shall refer again. That the atrophy of the ovaries precedes that of the uterus, is probably due as Hegar believes (supported by Krieger) to the cessation of the reproductive power in women before the occurrence of the menopause. The idea that the ovum is no longer sufficiently developed to become fertilized, furnishes, in his opinion, a natural explanation of this relation. On the other hand, Hegar thinks also that a proof of the independence of the monthly flow and ovulation is furnished by those cases where pregnancy has occurred after menstruation has ceased for years, but where formerly the periods recurred normally for months.

As before stated, retrograde metamorphosis takes place also in the uterus, vagina, and external genitals. An increase in the size of the uterus (from increase in the amount of blood) is frequently noticed at the beginning of the menopause; later it becomes smaller in all its dimensions. The wall of the organ becomes much thinner, the os internum smaller, and is often even obliterated. The cervix becomes shorter and thinner (Krieger), sometimes hard, sometimes as flabby as a membrane (Canstatt). Uterine catarrh occurs almost invariably, and only ceases in advanced years. Displacements of all kinds are frequent, but, on account of the now greatly-diminished weight of the uterus, these are without significance. The vagina is at first almost always uniformly hyperæmic. This disappears as the vessels successively atrophy, but it takes place much sooner in some spots than in others, hence that characteristic appearance of dark-red spots on a very pale ground. Whether or not it assumes the character of a true inflammatory process, gradually the vaginal canal becomes partly or entirely contracted, so that it is narrower, shorter, and often assumes quite a conical shape at its upper end. The mucous membrane gradually loses its rugæ, and presents a pale, grayish, blanched hue (Krieger). The introitus is also narrowed and its mucosa shows the same changes. Hegar has properly called our attention to the fact that coitus in individuals with the "contractions and even strictures so often observed," representing the results of this atrophic change at the climacteric, may prove the source of nervous manifestations.

The changes in the mons veneris and labia consist in the gradual disappearance of their adipose tissue. We must certainly agree with Kisch in attributing the final transformation of the labia into mere flaps of skin, the thinning out of the pubic hair, essentially to senile changes, and not directly to those of the climacteric. Still, it seems to me that it is difficult to make a precise distinction in this respect. Even these last-mentioned tissue-changes, as well as most of those before described are observed sometimes earlier, sometimes later. Hegar adds with regard to the shrinking processes just mentioned, that we see them after the climacteric, and "sometimes even in younger women." We must refer at least the beginning of all these changes to the time of the menopause; the further development of the same, then, is included within the limits of this period, or extends more or less beyond them. Only in this way do we assign to these changes their proper sphere; the process which is implied in them all, retrograde metamorphosis, which affects the entire sexual system of the woman, has its definite beginning, at least, at the time of the menopause. In this connection the following case of Chadwick seems to me to be very instructive: A woman aged forty-eight had not menstruated for about ten years, and indulged in sexual intercourse after having refrained from it for four months; in consequence she had violent pain and profuse hemorrhage. Chadwick discovered in the upper third of the vagina a recent tear an inch long, extending to the depth of half an inch into the cellular tissue. The vagina, "on account of senile atrophy," was considerably shorter and narrower than it was originally.

In my own practice a woman fifty-four years of age, who had not menstruated for two years, came to me complaining of pain during intercourse. She felt every time as if the vaginal orifice was being torn. On examination contraction was found to be beginning

In a strong peasant woman, aged fifty-two, whose menses had for the first time ceased for six months, and some weeks before had reappeared in the normal way, I noted the following: Uterus clearly diminished in size, vagina pale, contracted and smooth, with the characteristic reddish islets, labia extremely atrophied and flabby. The changes in the external genitals had already begun, although the woman was only in the midst of the menopause. A more or less complete involution of the mammary gland accompanied the above-mentioned change. The more rounded form of the breast, which sometimes developes later, depends entirely upon an increased deposit of fat, which is also observed during and after the change of life, either in spots or generally diffused throughout the entire subcutaneous tissue. Of this, more will be said later.

We must now touch upon a point which to some extent stands opposed to the conditions which we have thus far described, although in my opinion it may nevertheless be harmonized with it—cases of so-called "late conception." These are divided into two classes. The first class includes those cases in which the periods recur regularly and conceptions occur after the usual age, until finally the true climacteric is reached, often much earlier than usual. That which we said some time before, with regard to persistent normally-recurring periods and the late menopause, applies to some extent to these cases. We can, with Krieger, attribute this prolonged fruitfulness to "an unusual vital activity and energy on the part of the ovaries, which commonly goes hand in hand with a peculiar activity of the general constitution." Cases of this character are reported in rather large numbers by some of the authors who have already been quoted here. Quite recently Rodsewitsch collected from Russian literature (1872 to 1881) eleven cases in which women from fifty to fifty-five years of age, had borne children. John Kennedy mentions a woman who was delivered normally at sixty-two (November, 1880), having begun to menstruate at thirteen, who since her twentieth year had borne twenty-one children, the ones before the last being born when she was forty-seven, forty-nine, fifty-one, fifty-three and fifty-six respectively. During the intervals she always menstruated regularly. The same author cites similar cases from Taylor's "Medical Jurisprudence."

The second class of these late conceptions is especially interesting, including as it does those cases where menstruation ceases more or less promptly, the menopause is apparently established, and then within a shorter or longer period thereafter conception again occurs, with or without previous recurrence of the menstrual flow. A number of such cases have been reported. Hegar refers to cases of Puech's. From Kisch's collected series I quote only that of Renaudin, in which a woman sixty-one years of age was delivered after the menses had ceased for ten or twelve years. Krieger mentions a Mrs. C. H., whose menses ceased at forty-eight; two years later irregular menstrual flow returned, conception took place, and finally a healthy girl (the ninth child) was born at full term. Deshayes, of Rouen, observed a case of confinement in a woman of fifty, whose menopause had occurred regularly two years before. The question is, how to explain correctly such phenomena. Does this class really belong with the former, or should it be sharply separated? To express it exactly, is this simply a question of persistence of the ovarian function, attended with intercurrent or positive cessation of the menses, or do both functions actually cease and only return (either ovarian activity alone, or both this and the menstrual flow) in consequence of this or that influence. If we adopt the latter, it is certainly most natural to seek for this cause in a return of the sexual function. Krieger laid stress, especially with regard to late conception, on the later period at which marriage was consummated. The procreative power of the husband generally seemed to have a predominating influence, but the reason for the persistent capability for conception, as viewed from this standpoint, remained unexplained. Moreover, by reason of the fact that those women who bear children late in life often have a numerous progeny already, this author was led to the opposite conclusion, that late marriage can not be the cause of prolonged fruitfulness. Now as regards particularly the cases in our second class, I do not find among them any special mention of late marriage. In one of those cited above, the child was even the ninth, from which alone it is shown that early wedlock may also be assigned as a cause. If then late marriage is not necessarily a causal factor even in this second class of late conceptions, then it must, in my opinion, be self-evident that the influence of coitus also upon the condition can not be very great. Hegar writes with reference to this second class of late conceptions, "How the function of the ovary is again renewed it is always very difficult to explain; perhaps through coitus." He himself points to this possible solution, but at the same time he acknowledges that it seems to him at least questionable. Equally questionable must be every other theory by which we would explain the return of the departed activity of the ovary. Other observations in the realm of Nature furnish no parallel occurrences which correspond sufficiently to the one in question. The comparison made by Burdach and Busch with regard to the appearance of new birth in old people, is only referable to the recurrence of menstruation in advanced age. We may allow this to be applied as far as it goes.

If, on the contrary, we seek for the explanation of our second class of late conceptions in another direction, and assume simply that ovarian activity continues after we suppose that it has ceased, and thus conception occurs, then the probability becomes much stronger. It has been demonstrated unquestionably since Bischoff's time, that ovulation may occur without menstruation. Amenorrhœa may exist with a rudimentary as well as with a normally-developed uterus, and yet at the same time ovulation may proceed regularly. De Sinéty describes the *post-mortem* appearances in a woman thirty-eight years of age, who had never menstruated. The uterine cavity was one and a half or two inches in depth, consisting principally of the cervix, the body being rudimentary as in the fœtus. In the ovaries were numerous corpora lutea. Normal pregnancy is the best proof of normal development of the uterus and perfect ovulation, in spite of the absence of the menstrual flow. In fact, this may sometimes occur in young subjects even before the appearance of the first menstrual period. On the other hand, women can often conceive and bring forth normally-developed children without even having menstruated: A case was recently related to me in which the almost complete cessation of the periods (they appeared at irregular intervals during the year, or even more rarely) led the lady in question to doubt whether she could marry. Reassured by her physician, she married and straightway conceived, aborting between the fourth and fifth month. In patients affected with lead-poisoning the menses are often absent for a long time, yet such women become pregnant. Finally, cases are well-known in which nursing women have conceived without the reappearance of the menstrual flow.

If we consider all these facts, we are justified in classing the cases of late conception after the cessation of menstruation with the observations above mentioned, and explaining them by the theory that in these instances the disappearance of the menses does not correspond with the actual change of life, but that the activity of the ovaries is here prolonged beyond the time of the menopause, and *de facto* has ceased at a later period and with different phenomena than usual. Krieger properly lays stress upon the practical importance of keeping this possibility before the eye, "partly in order to oppose the widespread popular error, that during the climacteric or soon after, conception can no longer occur, an error for which many a single woman has had to make a heavy atonement, and partly to guard oneself against momentous diagnostic errors." In our own second class of late conceptions, therefore, just as in the first, it is only a question of "unusual vitality and energy of the ovaries," and both classes, as regards their essential character, should be considered as one.

But, as regards the early disappearance of menstruation before the cessation of the ovarian function, then, if we wish to adhere to the view that there is an intimate relation between menstruation and ovulation, the opinion (which Petit has recently defended) is at any rate valuable that sometimes the stimulation of the genital tract caused by ovulation is not sufficient to produce a periodical flow of blood, and that accordingly the supposed menopause in this case is merely the expression of the somewhat weakened effect of ovarian activity; on the other hand, this phenomenon of prolonged ovarian activity after the cessation of the menstrual flow (if we include the before-mentioned observations on conception in amenorrhœa, in the chlorotic, nursing-women, etc.), strengthen us more than everything else in the supposition referred to above, that both processes, ovulation and menstruation, are perhaps connected only loosely, or not even at all.[1]

I would call special attention to the fact that these cases of late conception, after the cessation of menstruation, are in no respect opposed to the comparison of the climacteric processes, to the disappearance of the gland and its excretory duct, and to the supposition that the atrophy of the ovaries precedes that of the uterus. The cessation of the monthly hemorrhages in given cases, as is self-evident, indicates in no way that atrophy of the uterus has already begun. Proof of the persistent functional capacity of this organ is furnished by the occurrence of pregnancy, which may go on to term. Moreover, this supposition is perfectly tenable here, only the entire retrograde process has proceeded farther. The atrophy of the ovaries begins sooner or later after the last pregnancy, and only then does the final retrograde process begin in the uterus.

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[1] The fact that some periodical hemorrhages occasionally precede the late conception, after the menses have been absent for some time, can not really serve as an argument against the theory in question. For conception can occur, as well as ovulation, without even a single recurrence of menstruation, and from what has been said, it is much more probable that ovulation should have been going on during the entire period, in spite of the cessation of the menses.

CHAPTER II.

PREMATURE MENOPAUSE.

AFTER describing in a general way the manner in which the climacteric manifests itself in the genital organs (excluding actual pathological conditions), it follows naturally that we should now pass to those phenomena that are more or less of a morbid character, and to the more serious affections which we particularly observe in this connection; finally, we shall consider at greater length the share which the entire organism takes both in the slight and in the most serious disturbances that may occur in one or another region, outside of the genital tract.

Let us first turn to one of the most striking phenomena, the so-called sudden establishment of the menopause. I have already touched briefly on this phenomenon in the earlier part of this work, when I referred to the different ways in which the periods may cease, and alluded in that place to the fact that the sudden cessation of menstruation may certainly occur under entirely normal conditions, so that it may present at all events the form (although rather an unusual one) of the normal menopause. Under this head are included those cases in which at about the proper age of the given subject, the periods, which had hitherto recurred regularly and in a normal or slightly abnormal manner, cease for good, without being affected by any injurious external influence, and without the occurrence of any previous or subsequent disturbance of the economy, or without the objective demonstration of any organic disease. I myself have observed such cases, and every physician will be able to establish the fact of their occasional occurrence, as soon as he gives some attention to this matter.

In the great majority of the cases, however we can not doubt that the sudden cessation of the menses is pathological. As is known, this usually occurs in consequence of the influence of some physical or mental shock, or a serious general disease, an affection of the genital organs, a so-called "exhausting" factor that affects too severely the general strength. We find the following causes noted: Mechanical violence by a violent blow, push, or fall, a severe cold or wetting, a sudden fright, extreme anxiety, sudden grief, etc.; serious general diseases, such as tuberculosis, intermittent fever, typhus, cholera, recurrent fever, septicæmia, the acute exanthemata, poisoning (by phosphorus, arsenic, mercury, alcohol and opium); affections of the genital organs, inflammation of the ovaries, the uterus or its surroundings, atrophy of the uterus after difficult labors, benign or malignant neoplasms of the ovary. Among the so-called exhausting influences are the too rapid succession of confinements, abortion with profuse hemorrhage, violent coitus, continued diarrhœa, drastic purgatives, when taken during the menstrual flow, bleeding from hemorrhoids, venesection during menstruation, etc. It is evident that the causal factors of the sudden menopause ordinarily described are extremely varied. Since it is self-evident that the same causes may produce the same effect (cessation of the menses) at a relatively earlier period of life—some naturally always affect younger women—these factors are obscured by those which were mentioned as causes of the premature climacteric, that occurs in consequence of unhealthy influences. I can also omit special mention of these latter. I have already referred to the sudden and premature occurrence of the change in consequence of disturbing influences, social relations, etc. But the important question in this matter is this, to decide in certain cases whether the above-mentioned sudden and often premature cessation of the periods really signifies the true establishment of the menopause, or only consists in a disappearance of the menstrual flow, while ovulation continues undisturbed; and how then, this or that injurious influence in cases where it actually causes a sudden and sometimes premature abolition of all sexual activity, and consequently the true change of life, produced this effect.[1]

This is certainly a difficult question to solve, and if we keep it clearly in view, it can generally be answered only in part. We can dismiss from our consideration all those cases in which simple absence of the menstrual flow is at first inferred, and is subsequently demonstrated. All physicians have long been familiar with most of the forms of intercurrent, and even more prolonged absence of the menses, but we can not regard too skeptically the cases included under the head of sudden (premature) occurrence of the climacteric, not those which have been handed down to us, but also those of which we hear at the present day. Formerly the disappearance of the menstrual flow alone was always regarded as the indication. As long as the accompanying conditions did not point to one of the recognized forms of simple menostasis, the diagnosis of early menopause was soon made. By reason of the period of observation being too brief, it is probable that the observer also frequently overlooked the complete restoration of all the sexual functions, or the occurrence of a fresh conception with or without a previous recurrence of the menstrual flow. Accidental attendant phenomena of an external character seemed to establish the diagnosis. An accurate examination of the internal organs was either omitted, or was in part (as the examination of the ovaries) not yet sufficiently understood, as a rule. *Post-mortem* evidences sought for with sufficient zeal or those which were observed, were not properly compared with parallel cases. In fact, if we examine the literature critically, we find that in by far the great majority of the cases there is an absence of convincing evidence to support the diagnosis of sudden (premature) occurrence of the menopause. We are indebted to Hegar for a more thorough sifting of the typical cases. Depending mostly on his classification, I shall briefly estimate at their true value our previous list of the causes of the sudden (premature) climacteric. It will soon be evident from this how rich a field for still more extended work lies open in this direction.

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[1] I anticipate in remarking here that the conclusions given with reference to this matter will require a change in the definitions. In order not to be misunderstood, I treat it, first of all, however, from the standpoint most familiar to us, and shall return to this subject later.

1. In the first category, physical or mental shock, there are numerous observations regarding suddenly-occurring amenorrhœa. The results of examination of the external genitals are negative. There is, moreover, no doubt that we are generally predisposed to include such cases among those of simple menostasis, no matter how evident it is from the first that, in such cases here and there, there may actually occur changes so profound as to correspond to those of the true menopause.

2. Under the second head severe general diseases, we have already a considerable amount of positive information. As regards the conditions in tuberculosis, a case of Simpson's is extremely instructive. After her first confinement a tuberculous patient had amenorrhœa; at the autopsy the uterus was found to be greatly diminished in size, and the ovaries were small, hard, and without follicles. In this case also the presence of more or less normal conditions was established *à priori*, as shown by the pregnancy, and the *post-mortem* appearance of the genitals resulted from secondary processes, which, from all the indications, pointed to a premature climacteric in consequence of the general affection. The follicular apoplexy in intermittent yellow fever, etc., described by authors, Slavjansky attributes to a parenchymatous oöphoritis, which usually occurs among other affections of the sexual organs in acute infectious diseases. The same writer always found after typhus, recurrent fever, cholera, septicæmia, and the like, parenchymatous inflammation of the ovary in rapid forms of disease, near the periphery in the cortical zone, and confined almost exclusively to the primordial follicles, but in chronic forms limited to the more (or quite) mature Graafian vesicles. The inflammation of the interstitial tissue immediately adjacent to the ovisac in these most marked forms of the affection, is then recognized microscopically as so-called follicular apoplexy. We are especially interested in the appended

observations on its course and termination. When an inflammation has once begun in the parenchyma of the follicle, the latter is destroyed; the primordial follicles, which are most frequently affected, become linear cicatrices. If the inflammation was not too intense, the normal ovisacs may be preserved. As regards our subject, we find here an explanation for those cases in which, in spite of a febrile affection (and in spite of the possible fear that the ovaries are already seriously involved), the function of the genital organs continues undisturbed. In a subsequent chance autopsy "the ovary offered few microscopical changes," corresponding to the negative results obtained by examining the ovaries in the subject when alive, but in harmony with the history, "the above-mentioned inflammatory processes were invariably found on examining carefully the cortical zone." Moreover, after a severe attack of typhus, or other affection, in which all, or nearly all, the follicles have undergone advanced parenchymatous inflammation, a *post-mortem* examination during the period of convalescence shows "the different phases of the destructive process in the large follicles," but in a section made at a later period, if the stellate cicatrices already occupy nearly the entire ovary, the latter "resembles closely the ovaries of women at the time of the climacteric; it appears smaller, its surface is corrugated, the tissue is hardened by reason of the development of the above-mentioned cicatrices, and frequently not a single follicle is to be seen on the cut surface." The condition thus pictured we can regard as essentially a sort of anatomical diagram applicable to all those cases in which, after recovery from typhus and similar diseases, a sudden change takes place in the sexual life. Under these circumstances we can properly refer the sudden amenorrhœa to a true rapid development (premature) of the menopause, because this, when compared with parallel cases, at once recalls the anatomical scheme; because, if the patient was sufficiently long under observation, the fact that the functions of the ovaries have ceased is proved by the sterility (women, whose ovaries are thus changed, must inevitably remain sterile, according to Slavjansky), and because, finally, the shrinking-process in the ovary, which causes alterations in their form and consistence, will hardly be overlooked during the bi-manual examination as made by a practiced hand.

In general the same change takes place in the acute exanthemata, as shown by Lebedinsky's examinations after scarlet fever. Lebedinsky found that at first the microscopical appearance of the ovaries was not changed, the microscope alone showing parenchymatous inflammation of the follicles in all stages. The following is the final result: Destruction of a larger or smaller number of the follicles with the formation of cicatrices, with consequent destruction of the ovarian function to a greater or less extent, so that even the reproductive power of the subjects in question may sometimes be doubtful. It is not necessary to dwell particularly upon the question of how far these conditions are to be classed with those before-mentioned. Myschkin pointed out that the same changes in the parenchyma of the ovary as were found in infectious diseases were produced by phosphorus and arsenic, while Hinsburg showed that mercury had a similar influence. Puech attributes an exquisite example of premature atrophy of the ovaries to alcohol, "which, as well as opium, must cause amenorrhœa and disappearance of the ovaries."[1]

3. We turn now to diseases of the genital organs. Some reference has already been made to parenchymatous oöphoritis. To what has already been said, we must here refer again, inasmuch as the majority of the etiological factors that produce this form of inflammation were described, and the influence of this affection upon the sexual life of the patients has already been noted. According to Slavjansky's work, we must add to the parenchymatous oöphoritis caused by acute infectious disease and toxic influences a similar form due to local troubles. Thus Slavjansky observed in general and localized peritonitis (which I consider extremely important in its bearing upon the study of the sudden establishment of the menopause) a parenchymatous inflammation, which is only to be distinguished from the before-mentioned variety by the fact that, advancing from the periphery to the centre of the ovary, it attacks the follicles without reference to their maturity, nor the youngest first and the riper ones subsequently. The final effects upon the function of the organ, which are of interest to us, are, if the inflammation is equally intense, confounded with those of the other form.

In the puerperal state the interstitial form of oöphoritis is most common, and puerperal affections are generally the principal cause of this variety. The rare cases of diffuse hypertrophy and sclerosis of the stroma or of small purulent foci in the same, in non-puerperal patients, already originate, according to Slavjansky, in a former confinement. Interstitial oöphoritis terminates in abscess-formation, especially after previous formation of adhesions or hyperplasia and sclerosis of the stroma. The prognosis with regard to the persistence of isolated healthy follicles is twice as favorable as in parenchymatous oöphoritis. Yet, in these cases too, the loss of function in the ovary can be accounted for, either through severe secondary inflammation of the parenchyma, in which all the follicles are sacrificed, or through the formation of such a thick layer of sclerosed tissue at the periphery, that the follicles can not rupture and thus again they are destroyed. Brièrre de Boismont reports a case of complete destruction of the parenchyma of the ovary in consequence of suppuration; the destruction of the ovary from purulent peritonitis, salpingitis, and oöphoritis is demonstrated at autopsies. We recall here some statements of Olshausen's as comprehensive indications in the examination of the living subject. In abscess of the ovary (an unusual termination of the inflammation, generally affecting only one ovary) the organ may be enlarged to the size of a man's head, and the pus frequently is not discharged, in one or another locality, until after a long interval. In consequence of hyperplasia of the stroma, the organ may become as large as a hen's egg or the fist, while it preserves its normal shape and feels like a very hard mass, commonly called "hypertrophy of the ovary." Finally, after interstitial inflammation the connective tissue may undergo a process of cicatricial contraction (so-called granular atrophy, or cirrhosis of the ovaries), "which, in consequence of contraction of the external surface at several points, leads also to destruction of the follicles, and thus produces a sort of premature involution of the ovaries. The ovaries may consequently become unusually small, about the size of a hazel-nut."

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[1] Hegar (supported by Burkart, Levinstein and Erlenmeyer) affirms that the morphine habit is a factor that certainly seems to produce amenorrhœa and temporary sterility through the cessation of ovulation. I have not yet had access to any notes on the appearance of the ovaries in these cases. Temporary sterility would, of course, not yet signify premature menopause. I myself observed a case of the most aggravated form of morphinism, which terminated fatally at the expiration of five years. Amenorrhœa was almost constant during the latter years; yet conception took place after the condition had existed for three years, and a child was born at term about a year before the patient's death, after which amenorrhœa persisted until the end. The patient died in her thirty-third year, having been confined four times in all. An autopsy was not allowed. It is evident from this that not even is temporary sterility a necessary consequence of even the most aggravated form of morphinism.

As regards inflammatory conditions of the uterus, Hegar thinks that the presence of old firm hypertrophied connective tissue, is a condition of frequent occurrence in amenorrhœa, but that it is "partly or entirely dependent on ovulation" has hitherto not been sufficiently made out. Moreover, in a recently-reported case of Durand's, in which suppression of the lochia occurred on the fourth day after delivery, and subsequent persistent anæmia (although the molimen persisted for years), the uterus was found to be enlarged.

Of equally doubtful value as regards our subject, is atrophy of the uterus as observed under different conditions. We only consider here in a preliminary way that form of atrophy which follows puerperal metritis. The amenorrhœa that attends this condition can only be explained by a simultaneous affection of the ovaries. How far this accords with the condition in the above-mentioned forms of atrophy of the uterus, we shall see below. In general the inflammatory conditions of the uterus (at least up to this time) furnish scarcely any explanatory hint concerning the abnormal appearance of the menopause, which we are now studying.

As regards the inflammatory processes in the vicinity of the internal sexual organs, the case is different. That which concerns us most is the inflammation of the periphery of the ovary, so-called peri-oöphoritis. According to Slavjansky, this occurs in parenchymatous oöphoritis, usually only as a localized, circumscribed process; certain spots on the external surface (corresponding to the more deeply situated diseased follicles), become the seat of fibrous, papillary bodies, consisting of connective tissue, which is sometimes newly-formed and rich in cells, sometimes composed of coarse fibres. Again, when the inflammation at the periphery is intense, pseudo-membranes develop, which lead to adhesions; however, between their points of attachment there still remains a considerable portion of the surface of the ovary which is unaltered. More often peri-oöphoritis accompanies interstitial inflammation of the ovaries, and then usually extends over the entire periphery of the organ. Pseudo-membrane may form and enclose the ovary like a capsule, and in consequence, "even in very slight forms of interstitial oöphoritis, in which the newly-formed stromal tissue is not so extensively altered," the follicles may be destroyed, since this capsule, just like the above-mentioned sclerotic layer of connective tissue in simple interstitial oöphoritis, prevents them from rupturing.

According to Olshausen, an affection much more important than this secondary peri-oöphoritis, which accompanies puerperal interstitial oöphoritis (and is also, as a rule, associated with general peritonitis), is primary peri-oöphoritis, the most frequent cause of which is the extension of inflammation from one of the tubes, gonorrhœal infection, acute catarrhal inflammation, or sometimes acute inflammation, suppression of the menses. These inflammations which extend from the tubes need not be exactly acute in character; there are often repeated attacks, which lead to the formation of exudations that surround the ovaries. The latter are often found, under these exudations, unusually small, hard, and generally with a smooth exterior. According to the author just mentioned, this is "a condition of quite simple atrophy of the glands as a result of pressure and obstruction of the blood-supply." The symptoms of this inflammatory process are naturally so blended with those of other forms of circumscribed peritonitis, that Olshausen could properly remark that what he called peri-oöphoritis, could in the majority of cases be described equally well as peritonitis. In like manner, as far as our observations go, all the similar inflammatory processes in the vicinity of the pelvic organs possess the same significance as the process in question, provided only that the ovaries share in the trouble to a corresponding extent.

Finally, passing mention should be made of parametritis chronica atrophicans (Freund), since premature menostasis is described as one of its results. Schultze thinks that this affection is a later stage (perhaps also a more intense form) of the chronic and sub-acute parametritis which he had observed. Bandl seems inclined to lay to this affection all the profound disturbances of nutrition and of the nervous system, which he has frequently seen to persist for a long time after the parametritis has apparently run an entirely favorable course. The entire process, of course, requires further proof and more careful study. However, if we connect the partial amenorrhœa described by Schultze, and the "quite frequent" enlargement and sensitiveness of the ovaries in simple parametritis posterior, with the premature menostasis which we have attributed to a supposed more intense process, then it occurs to us involuntarily that possibly the latter should be explained as having an important bearing upon our subject. We might mention atrophy of the uterus after difficult labors, as a not uncommon cause of the premature establishment of the menopause. Some other forms of atrophy of the uterus belong under the same head.

Severe puerperal lesions cause this condition by producing more or less extensive inflammatory processes, leading to atrophy. Among these are included puerperal metritis (to which reference has already been made), para- and perimetritis, etc. Another form is simply so-called "puerperal super-involution" of the uterus, in the production of which previous inflammation is supposed to take no part. Hegar mentions a case of Courty's, in which after a normal labor, the periods returned only once in a year, while the uterus became so much atrophied as to resemble the senile organ, even the cervical canal being obliterated. How far also obscure inflammatory processes may share in causing simple puerperal super-involution is obviously uncertain. Cases of marked atrophy of the uterus from other causes belong here, such as Louis Mayer's case of cessation of the menses in consequence of a violent fright, and subsequent demonstrated degeneration of the uterus, in a woman of thirty-four. Atrophy of the uterus from pressure by adjacent or super-incumbent tumors (such as sub-peritoneal fibroids, solid ovarian tumors, or large immovable exudations) possesses less interest for us, and we shall, moreover, consider these conditions elsewhere from a different standpoint. Finally, there is another interesting form of atrophy which is mentioned in the works of Scanzoni and Mayrhofer, on the authority of Klob. This is due to defective innervation of the pelvic organs, such as occurs in different forms of paralysis. Young women, who were previously quite healthy, and had menstruated regularly, who are subsequently affected with paralysis of the lower half of the body, suffered from this time forwards with amenorrhœa, while their uteri were extremely small, a condition "which could sometimes be demonstrated on autopsy to be due to true atrophy of the organ."

When we consider these different forms of atrophy of the uterus in their relation to the accompanying amenorrhœa, we cannot avoid the conclusion as regards them in general, that the real primary trouble here is dependent on a change in the ovaries, and that the atrophy of the uterus, as well as the amenorrhœa itself, belongs only to the series of secondary changes. I hold, at least (being supported in my opinion, partly by a review of the cases themselves, partly by their analogy to similar and well-authenticated cases) that it is not illogical to assume in every case from the outset a distribution of the ovarian function, even when the grounds for this belief are quite small, or even entirely absent. The atrophy of the uterus, however, should then be simply regarded again as the retrograde metamorphosis of the excretory duct of a gland that has become functionally useless, entirely analogous to the comparison of Hegar's already mentioned at the beginning. This view is partly supported by the words of the author just quoted, if I interpret these rightly. In contrast to the above-mentioned "puerperal" forms of atrophy with amenorrhœa, he alone observes that, although unfortunately sufficiently numerous and exact anatomical investigations are wanting, yet doubtless, "through inflammatory processes in the vicinity of the ovaries these organs are compressed and diminished in size, or suffer in some other way changes of structure, whereby the follicles may be completely destroyed." This exclusive reference to the condition of the ovaries seems to me to show that Hegar in the question at issue also, thinks that the ultimate cause of the trouble is in these organs. As regards, furthermore, atrophy of the uterus after suppression of the menses, we have already referred to the opinion defended by Olshausen, that primary oöphoritis is produced by extension of an acute inflammation through the tubes. The theory of "ovarian causes" was thus supported, in at least the majority of those cases in which the outbreak of such an acute inflammation corresponded to the original injury. Finally, amenorrhœa in the last-mentioned variety of atrophy of the uterus, is also produced by defective innervation of the pelvic organs in consequence of different paralytic conditions, which are regarded by the authors just cited as dependent less upon an abnormality of the uterus "than upon the atrophied condition of the ovaries, which is almost never absent in these cases."

The propriety of attempting to establish a relation between early development of the menopause and well-marked atrophy of the uterus, seems to me to be, so far at least, doubtful. We are able to erase the latter from the list of causal factors, and to include it among the above-mentioned sequelæ, just like senile atrophy after the normally-occurring climacteric.

Degeneration of the parenchyma of the ovary by benign or malignant neoplasms, on the other hand, always plays one of the most important *rôles* in our question. As regards its bearing upon the early occurrence of the menopause, it seems to me that this cause is best classed with inflammation of the ovaries or peri-oöphoritis. In this case, as in the latter, both ovaries may be affected, and yet their function may be preserved; if the process in question becomes more extended, complete and permanent loss of their activity results. Holst reports the case of a multipara, aged forty-seven, who died at the eighteenth or twentieth week of pregnancy. The left ovary was transformed into three cysts as large as apples, while at the site of the right was a medullary carcinoma; on both sides there were no traces of the normal parenchyma. Yet pregnancy occurred, so that a short time before the requirements for the fulfillment of the physiological function were fully satisfied. Korn reported at the Gynecological Society in Dresden a laparotomy on account of cancer of both ovaries, in a woman aged fifty-eight, who had up to that time menstruated regularly. It, of course, does not belong to our task to investigate the question how far menstruation may persist in cases of benign or malignant degeneration of one or both ovaries,[1] how small a residuum of normal ovarian tissue may suffice for ovulation, in what portions of the tumor the latter is still to be found (at the insertion of the pedicle, according to Waldeyer), what kind of a flow, in such conditions, is to be regarded as true menstruation, and what as a pathological hemorrhage, etc.,—topics which we find described in a particularly ingenious manner in Gusserow's work on menstruation and dysmenorrhœa. It hardly concerns us to decide, with regard to the opposite question, whether when the early (sudden) menopause has actually occurred, it should be attributed to the presence of degeneration of the ovaries or not. There can, of course, be no doubt on that point, especially if no other causes can be found, and the morbid process seems to have assumed sufficient importance. If other possible causes, such as recent inflammation, etc., exist simultaneously, these must naturally be taken into account.

4. With reference to the so-called exhausting influences we must be allowed to speak rather more generally; only at the outset it should be emphasized that from this list all those cases are to be omitted in which inflammatory processes play a part. However, it is difficult to prove positively that in many of the observations reported up to the present time there must have been latent inflammation, the significance of which was not suspected. Such an explanation is, in my opinion, to be offered of certain cases of premature menopause after the too rapid recurrence of parturition, after too violent coitus, and perhaps also instead of the causal factor "purgation during the menstrual period," etc. However, aside from these, there remain some important factors (usually described under the terms "exhaustion," "wasting sickness," "weakening of the bodily powers," or, to use the most comprehensive expression, "sudden anæmia") which we must take into account. In addition to these there are "clear" cases of too rapidly recurring parturition, persistent diar-

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[1] Comp. Leopold, Arch. für Gyn., VI., Tab. 2.

rhœa, etc., as well as profuse hemorrhages after abortion, cases of bleeding hemorrhoids, venesection during menstruation, etc. Among all these anæmia certainly plays the principal part, not only where it results suddenly from actual loss of blood, but also in cases in which it has developed gradually in consequence of impaired nourishment, due to some other disease, etc. The ovaries are rendered functionally incapable, sometimes suddenly, in other cases in consequence of successive deprivations of their blood supply. In certain instances (and these are the ones with which we are concerned here) this disturbance is permanent. We are ignorant of one fact which might explain this matter, and that is, why the acute loss of blood, which is certainly soon made good in most cases, should lead to such permanent bad results. Here again we can hardly infer the presence of rapidly-developing, but irreparable disturbance of the innervation. Their true character is still obscure, although analogies are not wanting in other cases.

When we can exclude successive attacks of anæmia, the only explanation that is left to us is this before-mentioned disturbance of innervation. Although the true nature of the latter, as has been stated, has not yet been discovered, the manner in which it acts in the various isolated cases of premature menopause, must soon be understood. Thus, we know that after numerous labors, for example, a moderate degree of cirrhosis of the ovaries (to which reference was made) occurs in the women in question as a physiological consequence. Klebs classes this with the hyperplasia of the ovarian stroma, that takes place in every pregnancy, and which may then, like a pathological hyperplasia, lead to contraction. Early occurrence of the menopause may result in some increase of this process. Although the real cause will perhaps remain unknown, we already understand clearly how this effect is produced.

If now we review these collected explanations concerning the various commonly-received causes of sudden (premature) menopause, it is evident that we ought not to be satisfied with many of these factors, at least as they have hitherto been described. Cases in which a shock or fright are briefly mentioned as the cause of the sudden cessation of menstruation, we ought not to regard as resting on a scientific foundation. Moreover, we cannot be content with the report of serious general affection, of an inflammatory process within the abdomen, or of an abdominal tumor, associated with amenorrhœa, urged in support of the supposed diagnosis; the same applies to the cessation of menstruation observed after rapidly repeated confinements, excessive loss of blood, etc. In all these cases there might be a temporary amenorrhœa, occurring after a short or protracted convalescence, in which after a moderate disturbance of the innervation the balance is again restored, an intercurrent lowering of the vitality is succeeded by restoration of the same, loss of blood is made good, etc. We cannot be sure even after long observation, for it is self-evident that in any instance the function of the ovaries (or of such remains of the ovarian parenchyma as might be present in tumors) might remain perfect, even where the menstrual flow was permanently absent; a fresh conception may surprise in cases where we hastily inferred the premature appearance of the menopause, just as well as in later years the advanced age of the patient seems to afford a double guarantee to the contrary. Our diagnosis of sudden (premature) menopause must rest upon a surer foundation. For this reason it certainly becomes infinitely more difficult, so difficult, that it is scarcely possible clinically to make a perfectly correct one. It involves proving that in the case in question there is actually a sufficient disturbance of the follicles, the environs of the ovary, etc., to completely and permanently destroy their functions. It is evident that this bare fact can only be fully established by a *post-mortem* examination, unless possibly the ovaries should be removed by the surgeon. Still there is a method which even in the living subject will enable us satisfactorily (when we consider the great difficulties) to discover this state of affairs. We have in the preceding pages considered briefly the causes which usually endanger the activity of the ovaries. Let us see how far the history of a given case renders it probable that such a disturbance existed. If we discover that the patient had an acute infectious disease, we must at once think of parenchymatous oöphoritis and its consequences; the same applies to certain toxic conditions. A similar suspicion will be awakened if there has been a general or localized peritonitis. Puerperal affections point to interstitial oöphoritis; again, after a moderate interstitial oöphoritis, secondary peri-öphoritis may assume importance. Gonorrhœal infection and acute catarrhal inflammation may cause primary peri-oöphoritis. Atrophy of the ovaries may accompany paraplegia. Innocent or malignant neoplasms of the ovaries may finally invade the entire normal parenchyma. The hyperplasia of the ovarian stroma accompanying numerous pregnancies may lead to threatening contraction. It will always be logical to assign a prominent *rôle* to nervous disturbances; however, we should never cease to be dissatisfied with this vague explanation, and should always endeavor to arrive at the true nature of such processes, varied as they are.

After we have harmonized to some extent the anatomical conditions and the present symptoms presented by the given case, we must make an exact gynecological examination. We shall not describe here how this is to be done, or dilate upon the extended experience, which, at the present day, is required. The earnest labors of specialists in this department are well known. I only crave permission to make a single observation here. It has reference especially to the practice of this special branch of medicine by general practitioners. Of course I am ignorant as to how far my experience on this point coincides with that of others.

For myself, at least, I am convinced that physicians in general ought to possess a far greater familiarity with gynecological examination than they have hitherto displayed. There are two reasons which may be assigned for this negligence, one being a certain prudery, the other the actual need of extended experience in order to arrive at a positive diagnosis. The first, according to my experience, plays a far more prominent part than is at first believed. Among young practitioners especially, I have noticed for this reason an almost entire neglect of this important practice. I might properly describe this entire conduct as nothing short of a want of sufficient earnestness. The second reason is, of course, always the more important. The early neglect seems to be irretrievable, partly through want of opportunity and instruction, partly through lack of time. But, that both causes still universally continue to prevent the attainment of the proposed end is rather due to the fact that the extreme importance of the whole question is not yet widely enough weighed and comprehended. That it is certainly necessary to possess wide experience in order to attain to sufficient readiness cannot be denied. But, remember that, in the beginning, opportunity for this is almost never wanting, and that in later years, although it is much more difficult, still much may be accomplished.

We have already referred above to the results of the gynecological examination in the cases here alluded to. The ovaries will be found to be diminished in size, indurated, and their surfaces irregular, or enlarged so as to form shapeless masses, perhaps fluctuating (in cases of abscess), or simply enlarged and hard (as in hypertrophy), or exceedingly small and hard (in cirrhosis), or, on the other hand, surrounded by masses of exudation and adherent to surrounding parts. Or, we may detect cystic degeneration, solid, benign or malignant tumors at the site of the ovaries, or a neoplasm on one side and an inflammatory process on the other, etc.

The condition in the upper portion of the genital tract is of great importance. Evidences of retrograde metamorphosis are especially to be considered. If, after what has been said, we are not satisfied with atrophy of the uterus alone as a cause, still, this condition, when associated with some other phenomena, will point to certain processes in the ovary. Here, again, we must, of course, exclude that variety which is due entirely to the pressure of a tumor adjacent to the uterus. The vagina and external genitals, also, may possibly present something worthy of note.

It may, of course, happen that the result of the gynecological examination proves to be entirely negative. Obstinate functional disturbances may occur under circumstances when nothing can be detected by the most practised hand; or, on the other hand, palpable changes are present, but are, on account of their limited character, overlooked, partly consciously, and partly through want of skill, in spite of the employment of the greatest zeal.

If now, in such cases, the most important support of our opinion, the condition of the pelvic organs, is wanting, then we must, after weighing the history and the most striking of the symptoms, resort with renewed thoroughness to the most careful consideration of a third point, which in every case, moreover, no matter how clear may be the condition, must not be disregarded. This is, certain general phenomena produced in the body by the menopause; the pictures of this character, occasionally presented for our observation, are sometimes extremely varied and complicated. As a rule, we can study them only at the time of the normal climacteric, but traces of them can often be detected even at the premature menopause, and they then possess an increased significance, especially if, as we have before stated, certain other evidences escape us. I shall discuss these changes in the entire organism more at length later. For the sake of thoroughness, I must here merely emphasize the importance of never omitting to look for such phenomena. I may be permitted, in concluding this chapter, to refer to pertinent and instructive cases that have come under my observation.

One of them shows quite typically the insurmountable difficulties that may, in general, sometimes confront us in deciding the question before us. Mrs. L., aged forty-five, always menstruated regularly from the age of seventeen, but had no children by two marriages. In her forty-second year, midway between two periods, she experienced extreme vexation; she felt at the same time a sudden pain in the middle of her abdomen, "as if her veins were being torn out of her," extending from the head into the true pelvis. Two days afterward she began to flow. The menses then ceased for six months, reappeared slightly, lasting for two days, then in the same manner after the lapse of another six months, and then they ceased entirely. She felt perfectly well, with the exception of slight attacks of cerebral congestion. A year after the original disturbance occurred, the patient observed a painless, immovable tumor, about as large as a nut, in the right hypogastric region; this gradually increased in size as years elapsed, and during the previous two months had grown rapidly. Violent pains along the course of the sciatic nerve, œdema of the lower limbs, obstinate constipation and difficulty in micturition led her to apply to me. I found that the symptoms were due to a universally hard and quite immovable tumor, having a smooth surface, which filled the pelvis and extended as high as the umbilicus. Nothing was discovered on further palpation; through the vagina and rectum nothing could be felt but the lower segment of the tumor which filled the entire pelvic brim. In no position was it possible to move the tumor to the slightest extent. The rectum was impassable; the bladder was elevated in such a way that the catheter could only be introduced with great difficulty in a direction vertically upward. The urgent symptoms called for prompt treatment. A consultation was held at once, but it failed to clear up the diagnosis. Two days later laparotomy was performed in our surgical clinic. On account of the general firm adhesions, and fearful parenchymatous and venous hemorrhage at every attempt to separate them, our distinguished operator, Professor Rzehaczek, was obliged to close the abdominal wound at once, without accomplishing anything. Death occurred on the following day, with symptoms of extreme anæmia and beginning peritonitis. An autopsy was refused.

Do we see here, from its final issue, how the premature and more or less sudden menopause was produced in this case? The patient's former physicians asserted, without further thought, that the premature climacteric was caused by the great vexation referred to. At all events, this would have been the cause assigned if the case had chanced to be published. But, in my opinion, there are three possible explanations. In the first place, the mental shock and the evident nervous disturbances connected with it, might have been the cause. Secondly, commencing degeneration of the ovaries (probably malignant), then in the early stage, might have destroyed the function of these organs; the marked decline in the patient's health, at the time when I saw her, as well as the appearances seen at the operation, speak in favor of this. Thirdly and lastly, it might have been simply an early normal establishment of the menopause, having no connection with the preceding,—perhaps a family peculiarity,—so that in this case all the above-mentioned abnormal conditions were unnecessary in order to explain it, although our entire attention is naturally directed to them at once. The last conclusion would seem to me to be most worthy of acceptance. The degeneration of the ovaries, if such there really was, is, as we shall see later, often a phenomenon noted after the climacteric. A year after the first disturbance of menstruation the patient first felt on one side a tumor, which at that time seemed to be not larger than a nut; hence it is hardly to be supposed that a year before the entire parenchyma of both ovaries had already undergone the degenerative process. The irregular hemorrhage occurring at the time of the nervous shock may have been the first beginning of the ordinary "irregularities," possibly having no connection with the shock; this is so much the more likely, since this hemorrhage recurred even after the lapse of six months; and a nervous disturbance exercising an importance here, would have tended much rather to interrupt permanently an existing hemorrhage, or, if it occurred in the interval, to have prevented future hemorrhages. Finally, I learned from the mother of the patient that she too had ceased to menstruate at the same age, so that this circumstance, as well as the late period at which menstruation began (in her seventeenth year), her sterility in two marriages, and the supposed spontaneous early menopause, combine to make us infer that in her case there was first of all merely "diminished sexual vitality," partly hereditary, and that the accompanying condition should be regarded as a serious complication which has no bearing upon the question at issue. This is, of course, only supposition; and this case illustrates clearly, as we have often observed in others, how in spite of all our endeavors to get at the facts, we are often compelled conscientiously to regard as extremely doubtful the value of our observations.

The following cases seem to me to be clearer: J. L., single, aged thirty, menstruated regularly since she was sixteen. At twenty-six she was delivered at term after a normal labor. Eight weeks after, she menstruated regularly. On the third day after the menses appeared the second time the patient was wet through, when the flow stopped suddenly, but there was no pain. For over four years there has been no reappearance of the flow, only a slight backache every four weeks. On the other hand, there are certain phenomena, which may be regarded partly as simple "congestions," partly as suggestive of climacteric phenomena, such as headache, vertigo, flushing, palpitation, neuralgia, depression, etc. On examination the external and internal genitals were found to be normal. Under the circumstances I felt justified in telling the patient that the periods would probably recur sooner or later.

The following is a genuine case of premature menopause of pathological origin: Mrs. H., aged thirty-nine, menstruated regularly since the age of twelve. Married at thirty-four, and aborted twice within two years. When she was thirty-six, her husband died suddenly, and she received such a shock that her menstruation ceased suddenly on the second day of the flow. She had slight traces of a flow twice, at intervals of four or five months, and for two years has seen nothing. There are no general symptoms except mental depression. On examination the vagina appears somewhat short and contracted; uterus small and thin-walled; ovaries quite small and freely movable. There could be no question here as to the diagnosis of premature menopause, since the secondary phenomena, the atrophy of the uterus, etc., were characteristic. The cause seems to be somewhat doubtful. Shall we ascribe it simply to that mental shock? After what has been said already, and from my experience in other cases, it would seem to me as if the previous abortions should not be disregarded. There is no proof that there was a general interstitial oöphoritis with subsequent contraction, yet such a process can also not be excluded. However, the nervous disturbance may have been the causal factor, yet this must probably have acted upon organs which were already affected.

CHAPTER III.

PATHOLOGICAL HEMORRHAGES.

HEMORRHAGES occupy the foremost place among the pathological phenomena of the genital tract during the climacteric. We mentioned at the beginning that irregular and rather profuse bleeding was of quite common occurrence at this period. Sometimes, however, these attain considerable importance, and the patient may by single or repeated hemorrhages, be brought to a condition of dangerous anæmia. This tendency to hemorrhages, in the absence of any gross changes in the pelvic organs, it is, of course, difficult to explain. The true causes are probably different in different cases. Scanzoni thinks that in many instances they are due to the senile rigidity and friability of the uterine vessels, which are not in a condition to offer sufficient resistance to the blood-pressure that is brought to bear on their walls. According to Kisch, the menorrhagiæ at the climacteric are due to the softening and relaxation of the uterine tissue. Additional causes are found in circulatory disturbances in the pelvic organs, and obstruction of the vena cava inferior, whereby the outflow of blood from the pelvic vessels is hindered, and a chronic stasis in the uterine walls is produced. The same author in another place quotes from Peter Frank, who attributes it to early and profuse menstruation, frequent and difficult labors, frequent abortion, and also to excess in drinking. Hegar affirms that in certain cases there is only simply an absence of any etiological factor. After numerous observations I am convinced that these climacteric menorrhagiæ, for which no cause can be assigned, may be explained from a different standpoint. I have sometimes observed such profuse bleeding in individuals who presented absolutely no ground for the supposition that structural changes in the vessel-walls have already occurred, and in whose cases the causes above-mentioned (frequent labors, etc.) do not exist, but whom I was obliged to regard before and after the menopause as intact, so to speak. The only explanation of such cases seemed to me to be this, that the single or repeated floodings in question were only the expression of vaso-motor disturbances,[1] such as those in other regions, which frequently characterize the menopause. These hemorrhages might, as regards their etiology, be compared with those irregular, sometimes very profuse uterine hemorrhages, which we frequently observe in certain women, having no connection with the menopause, due simply to different disturbances of the nerve-centres (fear, anguish, etc.); they are also analogous to certain other vicarious phenomena, epistaxis, intestinal hemorrhages, "congestive symptoms," which, as we shall see later, are almost always to be regarded more properly as a vaso-motor disturbance than as the result of "excess of blood." And they should finally (which seems to me of the most importance) be generally considered as nothing more than a special form of "sexual disturbance," a view which always leads us again to seek for their origin within the abdomen, but they are to be classed exclusively with the so-called general phenomena of the climacteric, the foundation of which is in certain profound changes of the organism outside the sexual sphere.

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[1] Perhaps inducing temporary inhibition of the centres presiding over uterine contractions.

Although I am convinced that some of the above-mentioned etiological factors (friability of the vessels, obstruction within the abdomen) frequently play an important *rôle,* I believe, on the other hand, that in many of these cases the explanation given is the only one necessary, and that to disregard it would be to leave an hiatus in our explanations.

The following case shows how severe such hemorrhages may be: Mrs. R., aged sixty, was always regular, only she menstruated rather profusely. She married at twenty-three, and had three normal labors within seven years. She was always healthy, but her nervous system was highly irritable. Although perfectly well, she had a sudden and profuse flooding at forty-nine, and this was repeated at intervals until she became so anæmic that she was obliged to pass two entire winters in bed. The hemorrhages ceased at fifty-one, and she became strong and well as before. The most careful physical examination failed to explain the loss of blood.

The violent hemorrhages at the climacteric are of course much easier of explanation if some abnormality of the abdominal viscera is recognized on examination which, according to experience under other circumstances, also favors an increase of the normal hemorrhages from the genitals, or, moreover, may of itself give rise to bleeding. Every abnormality of this nature, of course, possesses increased significance in connection with the general tendency to more profuse loss of blood at the menopause, which loss is always referable in part to the before-mentioned condition. Among these we must mention: acute and chronic inflammatory processes in the pelvic organs, especially hyperplasia of the uterine muscle and connective tissue (Hegar), certain flexions (retroflexion), prolapsus uteri, polypi, fibroids, and carcinoma.

Likewise all those pathological conditions elsewhere in the pelvic cavity and thoracic viscera, should be considered, such as necessarily favor obstruction in the vena cava inferior and the resulting hemorrhages (tumors of the liver, cardiac lesions, etc.). Scanzoni lays stress on previous chronic enlargements of the uterus (as shown by the flabbiness, softness, and swelling of the uterine parenchyma) due to circulatory disturbances in the abdominal viscera, as a common cause of profuse hemorrhages at the climacteric. We often meet with the most varied complications in this direction. Mrs. W., who had suffered from her youth with mitral insufficiency, began after the birth of her third child to suffer from extremely profuse menorrhagia, which was subsequently attended by metrorrhagia. Finally, an examination revealed the presence of an interstitial fibroid. The case was then further complicated with psychical disturbances (a delusion that she was being followed); she was then in the middle of her thirtieth year. A specialist in nervous diseases gave her to hope that the latter troubles would be relieved at the menopause; on the other hand, that period was to be feared on account of the condition within the abdomen. Before this time, however, under the administration of small doses of ergot, the fibroma was expelled piecemeal quite rapidly, and the uterus entirely recovered its normal condition. Now, at the beginning of the fortieth year, irregular hemorrhages are again noted. The psychical disturbances are disappearing. On account of the perfect normal state of the pelvic organs, I can attribute the present hemorrhages only to the premature climacteric bleeding favored by the heart trouble.

The following are two more cases belonging to the former class of hemorrhages, in connection with disease of the genital tract:

Mrs. H. always menstruated profusely, but quite regularly, and had two normal labors. Now, in her thirty-ninth year, she has begun to have irregular hemorrhages. On examination a small interstitial fibroid, the size of a nut, is found in the anterior uterine wall. Considering some other phenomena (increase in fat, nervous disturbances, etc.), the present hemorrhages are to be ascribed rather to early climacteric bleeding than to the small fibroma.

Mrs. M. menstruated regularly until her fortieth year. After forty-one she flowed profusely, but regularly, for nine years. An interstitial fibroid was found on examination. The patient is now fifty-one, is very anæmic, and there is no diminution of the hemorrhage.

We emphasized at the outset the fact that the physician should, at the time of the menopause, consider most carefully every variation from the normal; this applies particularly to every case in which there are marked uterine hemorrhages. Even before we make an examination in cases in which hemorrhages depend upon some pathological condition of the abdominal or thoracic viscera, we suspect three things. Either the menses are constantly becoming more profuse long before the usual menopause, or atypical hemorrhages are already beginning unusually early, or the hemorrhages at the ordinary time of the menopause (regular or interrupted by irregular intervals) have become unusually profuse, or, finally, the regular or irregular losses of blood are unduly prolonged, often far beyond the fiftieth year of life. Whenever a patient gives a history pointing to these facts, we must at once make a thorough and accurate examination.

In the above-mentioned cases I have already cited some observations on the early appearance of abnormal hemorrhages in connection with supposed diseases. Examples of unusually profuse bleeding of pathological origin at the normal period of the menopause occur very frequently during a year's practice. The most aggravated case of this nature that I ever saw occurred in a patient having a sub-mucous uterine fibroid as large as a child's head. The most dreadful hemorrhages set in towards the end of her fortieth year. All proposals to operate were declined. During her fiftieth, fifty-first and fifty-second years, after one or two attacks of flooding, she was each time literally near dissolution. She had advanced to general œdema, and on one occasion, had a prolapse of the rectum as large as a man's fist. I was obliged to tampon. In another case a woman of fifty consulted three physicians in succession, on account of excessive hemorrhages and marked œdema. Without examining her, they all made a diagnosis of "bleeding due to the climacteric," and insisted that there was no danger. The real trouble was advanced carcinoma of the cervix. My own extremely unfavorable prognosis was, of course, received with some indignation by the attendants. Unfortunately it was confirmed, hardly two weeks after, by the death of the patient. Therefore I consider it important always to insist upon the necessity of an immediate examination in all cases of rather marked bleeding at this period, as I have often observed the women themselves frequently fail to regard them as sufficiently serious, and may in consequence cause many a physician to err. Women are aware that irregularities and increased flowing are usual at the menopause; they generally console themselves with this explanation, even when medical aid has been summoned.

Physicians unfortunately often show similar carelessness, and allow themselves to be more confirmed in this by the patients themselves. This is entirely wrong. The physician should from the outset be rather too mistrustful of such cases. He ought not to allow himself to be diverted from an examination which has once been decided upon. Finally, typical or atypical hemorrhages may, as before-stated, be unusually prolonged in the diseases in question.[1] In cases like those described above (heart-lesions, interstitial fibroid) we shall scarcely go amiss if, taking into account the cause of the early onset of the atypical hemorrhages, we prophesy also their late cessation. In one of the cases cited (Mrs. M.), there is no diminution in the profuseness of the bleeding at the end of the fifty-first year, in spite of the fact that the increased flow has continued for ten years. In the case of sub-mucous fibroid, I noted the last and about the most violent flooding after the patient had passed her fifty-second year. A certain Mrs. T., now under my care, had at the close of the Spring, in the beginning of her fifty-second year, the most frightful hemorrhages from the uterus, which was enlarged by fibrous growths to four times its normal size.

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[1] Inflammatory conditions of the uterine appendages may produce the same effect in this respect as neoplasms.

The following case is interesting: Mrs. D. has menstruated regularly since her thirteenth year, bore two children, and now at fifty-one there is not the slightest change in the character of her menses. In spite of various climacteric phenomena, the time of appearance, duration, and amount of the flow is the same each month as in former years. Since her mother was forty-eight when her last child was born, this may be simply a case of "increased vitality" in the organs involved. The condition found on examination points to a different conclusion. In the right half of the corpus uteri is a sub-mucous fibroid as large as a man's fist, with a broad base. It seems to be legitimate to infer from this that the principal cause of the persistent hemorrhages lies in this abnormality of the uterus, and that these show no more marked irregularity, simply because the manner in which the tumor happens to be imbedded in the uterine wall is relatively favorable. The important fact to be derived from this case is this: The most perfect regularity in the monthly flow at this period does not justify us in deciding at once that the conditions are normal, and that there is simply a delayed menopause. If these regularly-recurring hemorrhages are prolonged beyond the usual time for the menopause, we should at once consider the question of making a thorough examination.

I come now in the following pages to speak of the hemorrhages that are observed at a still later period. I should like to emphasize the fact that, so far as my own experience extends, fibroids in the uterine wall are the most frequent cause of profuse bleeding at the actual menopause. I have unfortunately not at hand a true summary of the experiences of others in this special direction. Inflammation of the pelvic organs, according to my own observations, were generally the cause of the disturbances in question at an early period, while malignant growths (especially carcinoma uteri[1]) were the cause at an early period, or after the climacteric, although their commencement perhaps dates back to the menopause.

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[1] According to Gusserow (Billroth's "Handbuch der Frauenkrankheiten," IV., p. 226) cancer of the portio vaginalis occurs most frequently between 40 and 50. Cancer of the body, he says (according to Pichot's collection of cases), generally occurs at a later period.

Although this may belong rather to the possibilities, nevertheless, it has always seemed to me to be worthy of note. In this connection I turn to another very important theme, that of hemorrhages after the climacteric. These, from the nature of the case, are observed less frequently, and perhaps many physicians must, therefore, be somewhat less conversant with them, but they deserve double the attention for this reason, since it is absolutely certain that they are due to some pathological condition. The women themselves, I must insist in the first place, are generally inclined to regard these hemorrhages as a recurrence, or, more exactly, as a prolongation of their menses, and in consequence mislead the physician, and frequently delay for a long time consulting him on the subject. Now, it is important above all in the first place to positively insist upon the investigation of cases of hemorrhages at and after the menopause, and in the second, to observe with great caution every case, even of slight bleeding, which, in our opinion, occurs after the menopause has been established. It may, of course, happen that the causes of post-climacteric hemorrhages began at the actual menopause; the clinical picture may be obscured, so that it may be extremely difficult to exactly separate the bleeding at and after the change of life. Accurate observations, a review of all the phenomena, and a careful investigation of the most striking, will nevertheless settle the question. It will be established that the apparently "protracted hemorrhages at the menopause" were only partly to be regarded as such, but that they really belonged to the post-climacteric period, and were caused by one or another affection, the only striking points about them being that they occurred so soon after the establishment of the menopause.

Usually, however, there is a rather long interval after the cessation of the true climacteric bleeding. The presence of certain links in the chain of the existing climacteric phenomena assures us that the menopause is already established. Fresh hemorrhages appear, but they are of shorter duration, slighter or more profuse, or more continuous than before, while they are atypical and irregular. If, however, they should ever show any regularity, this should be carefully noted, as I have always found them under such circumstances to be suspicious. This or that disturbance in the health of the woman in question, or often the very manner in which the bleeding begins, points to certain affections; the examination, which ought at once to be undertaken in every case, soon throws light upon it as a rule.

I might mention, as closely related to these post-climacteric hemorrhages, those which seem to depend purely upon vaso-motor disturbances, a typical example of which I have already mentioned in the case of Mrs. R. "Five years after the establishment of the menopause, a violent hemorrhage took place, lasting for ten days, which never recurred. The examination in such cases, as in the one here referred to, gives an entirely negative result with the single exception of the highly irritable condition of the nervous system, which is general or limited to certain regions. That this irritability is increased in the most varied ways about the time of the climacteric, and for some time after, is not surprising after what we shall learn subsequently regarding the changes in the rest of the body at the menopause. A second variety allied to post-climacteric hemorrhages are those due to circulatory disturbances (obstruction of the vena cava inferior) the result of certain affections of the thoracic or abdominal viscera, excluding those of the pelvis. This form is completely obscured except for the difference in time by those mentioned above, under the pathological hemorrhages referable to the time of the menopause. We are indebted to Scanzoni for an instructive example of this character. A woman, aged sixty-four, ceased to menstruate at forty-eight, but from her fifty-second year until the time of her death hemorrhages recurred at intervals of three or four weeks. She had stenosis and insufficiency of the mitral valve of the heart. "The obstruction to the circulation in the system of the vena cava inferior could not be recognized in the cadaver." The ovaries atrophied, and there was no trace of ovulation at the former period. The uterus was enlarged and softened, the mucous membrane was congested, and within the cavity was a blood-clot that was quite recent.

The third and last variety includes those cases in which the post-climacteric hemorrhage is to be referred to some diseased condition of the pelvic organs themselves, especially of the uterus. I mention here first the much-described apoplexy of the uterus, due to rigidity and calcification of the vessels (increased friability), which is one of the most frequent evidences of senile atrophy. According to Klob there is an extravasation of blood especially in the fundus of the organ, less often in the posterior wall, and the foci in question vary in size from a pea to a pigeon's egg. Although such a fresh extravasation is observed in the uterine wall, an effusion of blood is often found within the cavity. The external hemorrhages due to this cause are frequently several (Klob), and apoplexy of the uterus in advanced life is the origin of many attacks of menorrhagia that are regarded as recurring menstruation. But since, according to the latter author, this condition "often gives rise to no marked symptoms except a more or less extensive infiltration of blood into the substance of the uterus, which becomes degenerated so as to form a sanious, dark red pultaceous material, subsequently changing to rusty brown and saffron yellow, we are justified in the opinion that, as regards external bleeding, every possible variation may appear from actual metrorrhagia to occasional slight traces." But the fact that this condition recurs now and then (so that it may even show a certain periodicity again) may serve to clear up many hitherto obscure cases of slight repeated hemorrhages.

Thus, I sometimes see a Mrs. M., who menstruated regularly from her seventeenth year, bore two children, and at forty-three presented every evidence of having passed the menopause. Now the woman is well on in the fifties, and for some time at intervals of from four to eight weeks, she has lost slight traces of dark-red blood, which escaped in drops, without pain and without any known cause, perhaps from occasional rather violent bodily movements. The most careful examination of the other organs gives a negative result, while the genitals merely show evidences of retrograde metamorphosis. There is no evidence of increased nervous irritability, warranting the inference that there is in this case a reflex vaso-motor hyperæmia of the uterine mucous membrane, although this may possibly play a part. The most probable explanation, I think, is that there is in this instance a certain friability of the vessel-walls (even when the woman uses her handkerchief rather vigorously, she observes at the conclusion of the act traces of blood coming from the nose), which, aside from the evident external hemorrhage, possibly causes changes also in the substance of the uterine wall, analogous to those referred to. Erosions of the portio vaginalis constitute an additional causal factor in this series of post-climacteric hemorrhages. These are often to be referred merely to profuse leucorrhœa (which, as is well known, is of quite common appearance after the establishment of the menopause), and then become the source of slighter or more marked hemorrhages, if any traumatic influence (strain, pessary, or coitus) is added.

Displacements of the uterus can be of significance at this time only in a restricted sense. Certain positions of the portio will, by reason of constant friction of the mucous membrane lead to the formation of erosions, and under favorable conditions to occasional hemorrhages. Enlargement and flabbiness of the organ will play a special *rôle* here (causing descent and prolapse). The following observation seems to me to be worthy of note in this respect: Mrs. P., who is otherwise perfectly healthy, passed the menopause thirteen years ago. On account of prolapse of the uterus, she has long worn a T-bandage. She recently informed me in great alarm that she had had traces of blood, which she was disposed to regard as the beginning of a serious affection, since nothing like this had ever happened before in all the past years. An examination revealed simply and solely that the source of the bleeding was some slight excoriation at the os. Even these were merely due to the fact that she had dispensed with her bandage for some time, and thus the cervix protruding from the vulva had been much irritated. Matthews Duncan describes as "bleeding lupus" of the female genitals an affection "which from its histological character, should not receive this name, but from its external appearance may be classified under it." The peculiarity of the affection consists in its tendency to hemorrhages of varying duration and intensity; the trouble must also bear a certain relation to the vaginitis that often developes after the menopause. In the first of the accompanying cases the patient was fifty-seven, in whom the author discovered a small urethral caruncle, and beside it a small red spot. The former had at the time of writing grown to the size of a pea, while the latter had become a flat ulcer of somewhat larger size, from which, as the highly-intelligent patient had herself positively declared, a very copious hemorrhage had recently occurred. Further experience must teach to what extent the condition here described is to be classed with post-climacteric hemorrhages. In the other cases, occurring in younger individuals, the ulcer, which was "half visible," was situated upon the cervical mucous membrane, in one case on the vaginal mucosa, while in a fourth the entire posterior wall of the urethra was wanting, and on the inner side of the left labium majus was a pale irregular ulcer, with sharp indurated edges, which extended into the vagina; subsequently bleeding took place from two arteries in its floor. Finally, there was on the right vaginal wall a smaller ulcer, like an incision, which was folded upon itself.

Krieger and others refer to varicose vessels in the cervical canal, as the seat of post-climacteric bleeding.

Furthermore sub-mucous polypi of the uterus should be mentioned here, since they are apparently quite often the cause of the disturbance in question.[1] Scanzoni mentions the case of a woman aged sixty-one, with hemorrhages recurring pretty regularly. She died of pneumonia, and at the autopsy the ovaries were found to be completely atrophied, while in the cervical canal were two small polypi. Krieger reports a similar case in a woman of eighty. I had a patient, aged sixty, in whom the bleeding was found to be due to two polypi in the cervix.

Post-climacteric hemorrhages in a fibroma of the uterus of long standing form one of the principal grounds for the suspicion of sarcoma. (For a more extended discussion of the process of degeneration, see further on.)

Carcinoma uteri is unfortunately a very frequent cause of hemorrhages after the menopause. From the merely "suspicious" cervix to the already extensive destructive processes, there may be every stage of the affection, at which the patient afflicted with carcinoma first comes under our observation. The reasons why at this period of life the disease is submitted to the physician, sometimes at its very inception, and again at such a late stage, are both the varying symptoms of the affection and certain mental factors, a tenacious adherence to the idea that the hemorrhages are simply recurring periods for Nature's necessary relief of excessive "fullness of blood," while in one case the pains are attributed to phenomena attending the change of life, and in another there is a fear of death, through some suspicion of an incurable disease, and through a constant belief that the menopause or the period succeeding it must be attended by some evil. I have very often observed at this time cases of carcinoma of the body and fundus of the uterus.[1] It is in the incipient stages of this disease, especially, that we must pay particular attention to certain pathological phenomena (an occasional slight reddish discharge, moderate tenderness of the abdomen, with increased general irritability, slight enlargement of the corpus uteri, etc.), even when these are slightly marked, since with these the local conditions often remain so long unchanged as to lull us into a certain security. (The portio remaining intact and the os closed, the uterus being freely movable, the parametrium not involved, the general condition good, etc.)

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[1] On the other hand, I must not forget to mention that submucous uterine polypi may often cause an apparent premature establishment of the menopause, since the irregular hemorrhages to which they give rise may perhaps be classed with certain phenomena that seem to signify the beginning climacteric. In one case a woman, aet. 41, who had irregular hemorrhages, intestinal disturbances, &c., supposed that she was at the change of life. The discovery and removal of a small submucous polypus removed these symptoms.

As a rule, after considering all the details of such a case, we shall be very early placed in a position to decide rightly concerning it, even without resorting to the microscope, for which there is naturally often no opportunity. It is by especially adopting the method of exclusion that we arrive at a conclusion here. If we are accurate in our clinical observation, we shall always find in these cases one point or another that allows us to exclude almost with certainty any other affection. In the case of a Mrs. M., depending almost entirely upon the hemorrhages, I gave an unfavorable prognosis to her relatives four years before her death, which occurred at sixty-one. For a long time my opinion was censured because of her persistent good condition. The rapidly-advancing cachexia, that finally appeared, unfortunately convinced all beyond a doubt. Another time the symptom was slight pain of a characteristic kind in the region of the uterus, occurring some years after the extirpation of a nodule in the breast and a gland in the axilla (after the menopause). My diagnosis of a secondary deposit in the corpus uteri, on account of the absolutely negative result of the examination, was doubted by the attending physician, even after the atypical hemorrhage began. Here too the confirmation of my diagnosis was not wanting. Mrs. T. was supposed by two physicians to have carcinoma of the liver, because of advanced cachexia and some peculiar symptoms which were misinterpreted. I found absolutely no change in the liver, while the corpus uteri was enlarged and hard, so that, in spite of the absence of any additional symptoms, I arrived at the conclusion (based especially on the existing cachexia) that the condition of the genitals was alone responsible for the entire trouble. As a matter of fact, the characteristic discharge soon appeared, and hemorrhages which hastened the fatal termination. Careful probing of the uterine cavity furnishes an extremely valuable aid in the early recognition of such cases. Not only does the expert generally recognize promptly in this way spots which are the seats of pathological changes, but he can usually draw some approximate conclusions as to the character of the change. When the affected spot is still quite small, curetting (to be mentioned presently) is a valuable means of ascertaining the exact seat of the disease. The removal with the curette or sharp spoon of pieces of the growth of sufficient size, on their examination with the microscope, of course, gives us certain information concerning the affection in question. This expedient should be employed wherever it is practicable.

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[1] Gusserow (Billroth's "Handbuch d. Frauenkrankheiten," IV., p. 226), emphasizes the fact that patients of advanced age are especially liable to this form of disease. Among 45 cases of carcinoma of the body, 23 occurred between 50 and 60.

I have just referred to the value of the sound. Before introducing a curette it is always wiser to dilate the cervical canal slightly, for the os internum offers a certain amount of opposition to the passage of even the smallest instruments used for diagnostic purposes. I would state here that a series of ordinary English bougies always do me good service enough in accomplishing this dilatation; one who may not possess the dilators of Hegar or Fritsch may readily aid himself in this way. As I have already said, it seems to me to be important that the size of the curette that is selected should correspond to the diameter of the dilator that was last introduced. When Fritsch, after ascertaining the width of the cervical canal, introduces the "corresponding" curette, I agree with him in this respect as well as in his investigations on the necessity of digital examination of the uterine cavity, which on the one hand involves previous dilatation up to the breadth of the finger, and on the other may be very dangerous, by reason of the manner of forcing in the finger. It is self-evident that after the curette has once been introduced, it is also used to touch and investigate the endometrium. I add here two recent striking observations:

B., widow, aged sixty-one. Menses stopped suddenly at fifty-four. Since then no bleeding, only constipation, frequent slight pains around the navel, general nervous irritability, and during the last two years severe intercostal neuralgia. During the past six months has begun to have a slight discharge of watery blood every two to three days. Moderate pain in the hip on locomotion and increase of the pains around the navel. Sleeps poorly and is losing flesh. First examination negative. At the second a sound was introduced and encountered a projection of rather firm consistence. Some fragments were removed and examined microscopically. The growth was found to be a typical adenoma, such as was described by Breisky. The mass was removed thoroughly, but recurred as an adenoma-carcinoma.

It should never be forgotten that the microscopical examination may be negative (if the scraping instrument fails to reach the site of the neoplasm), and nevertheless the diagnosis of carcinoma of the corpus uteri may be made clinically.

Mrs. K., aged sixty-eight, reached the menopause fifteen years ago. Well until four months ago, when she began to have hemorrhages. During the past eight weeks she has had pains in the abdomen, and for about a week there has been a fœtid discharge from the genitals. On examination I found her general condition good. Nothing was discovered by the bi-manual. On introducing the sound the uterine cavity was deeper than normal, and there seemed to be a projection near the fundus. Fragments were removed by the curette, and examined microscopically, the appearances being those characteristic of atrophy of the uterus with hemorrhagic infiltration of the mucosa. In spite of the favorable microscopical examination, the patient died a few months later with symptoms referable solely to carcinoma of the corpus uteri. From this case we see how important it is to search for the true cause of the post-climacteric hemorrhages, even if certain facts (in this case the microscopical examination) already seem to justify us in forming a definite conclusion. The tenderness of the abdomen, the quite irregular and finally constant hemorrhages, the foul discharge, the enlargement of the corpus uteri determined by the sound, and finally the growths which were certainly detected on its inner wall, necessarily aroused the suspicion of carcinoma of the body, especially when the age of the patient was taken into consideration, which, as we have seen above, pointed strongly to this form of disease. Although this could not be confirmed by the microscopical examination, the serious clinical symptoms must be considered, and it was absolutely impossible to take a more favorable view of the case, in spite of the microscopical appearances. The subsequent course of the disease removed every doubt. The case seems to me to be instructive, on the other hand, by reason of the microscopical appearances, which seem to show that the malignant degeneration was a final step in the process of senile involution.

Before I leave the subject of post-climacteric hemorrhages dependent upon some anomaly in the uterus itself, I would like to call attention to a circumstance which may possibly have connection with the same. Hegar calls attention in one place to certain consequences of extreme relaxation of the abdominal wall of the pelvis, to which too little attention has been paid. The anatomical change extends not only to the muscles and aponeuroses, but also the peritoneum and its folds, and nearly always involves the pelvic floor, the pelvic diaphragm, levator ani and fascia, as well as the peritoneal covering of the pelvis and its folds, the sacro-uterine and broad ligaments. The relaxation of the ligaments often leads to permanent displacement and abnormal mobility of the pelvic viscera, while the diminution of the intra-abdominal pressure causes increased congestion of the veins of the abdomen. The lowering of the intra-abdominal and intra-vaginal pressure affects the position of the uterus, and (in case the organ is fixed) also its circulation, so that after removal of the ovaries, for example, hemorrhages occur. Hegar observed in several instances that women whose ovaries had been removed continued to be quite well for some time, and then, in spite of every warning, they discarded their abdominal bandages and made violent exertions; hernia soon resulted, and all their nervous symptoms appeared together with hemorrhages. I myself have not observed whether relaxation of the abdominal walls may also play a similar part during the period that succeeds the normal menopause. At the outset it seems to me as if this matter could not easily be proved, and, therefore, I would like to direct my reader's attention to this point. On the one hand the conditions after the natural and artificial menopause are in many respects quite similar, but on the other (if we reckon senile conditions particularly among the former) it would be of significance not only if the relaxation of the abdominal walls could in itself cause post-climacteric bleeding, but also if this relaxation favored or kept up a post-climacteric hemorrhage due to other causes. That the latter might occur I should regard as probable. Special attention is also to be called to the fact that at the time of the climacteric there is almost invariably a marked tendency to enlargement of the abdomen, in consequence of an accumulation of fat in the abdominal wall, or meteorismus. If now these conditions, after having existed for some time, again disappear, there may often in such cases remain quite a marked relaxation of the wall, although in the beginning this was not present at all, so that, if the idea above advanced is correct, sometimes the direct exciting cause of these hemorrhages (*i.e.*, the relaxation and venous congestion) has its origin in the post-climacteric conditions themselves, and accordingly we must think of the existence of a separate class of genital hemorrhages which are perhaps characteristic of the post-climacteric epoch in the same way as are the hemorrhages that result from senile change in the vessel-walls.

Finally, I desire to state positively that, in my opinion, delayed recurrent menses can never be classed with post-climacteric hemorrhages. As was explained before, in the cases that apparently belong under this head (if the hemorrhages in question are really menstrual) it must be that, by the patient or her physician who based the opinion on certain phenomena, the climacteric was erroneously supposed to have appeared too early, when it really occurs later, often a good deal later, that is, with the termination of those late-recurring periods which were erroneously regarded as post-climacteric. But if this has really occurred, then the post-climacteric hemorrhages are, as I remarked at the beginning of this chapter, really the expression of some pathological condition—an important point which must not be forgotten even if these hemorrhages appear with typical regularity, so as perhaps to simulate in every particular the menstrual flow. The appearance of such regular losses of blood in connection with different pathological conditions at this time of life, is frequently noted. Here is an example from Battey ("Normal Ovariotomy," p. 16) who mentions the case of a woman who ceased to menstruate at fifty-five, and the flow reappeared at sixty, apparently in a perfectly normal manner. The uterus was hard, somewhat nodular, and immovable, but there was no ulceration. A year later she died of carcinoma.

CHAPTER IV.

THE INFLUENCE OF THE CLIMACTERIC ON CERTAIN PATHOLOGICAL CONDITIONS OF THE PELVIC ORGANS.

OF great interest, and to some extent of great practical significance, is the influence of the climacteric upon certain pathological conditions of the pelvic organs. Certain anomalies are directly caused by the menopause. Others, which already exist, are aggravated; others again retrograde and may be entirely cured, as soon as the menopause is established. Here and there I have already had occasion to refer to these circumstances. We saw that at the climacteric a catarrhal condition of the uterine mucosa may develop, which often lasts for a long time. This may frequently attain quite a marked intensity, even when the mucous membrane was previously perfectly normal. Enlargement of the entire uterus, sometimes merely in consequence of an increased supply of blood to this organ, sometimes directly due to inflammatory swelling at the menopause, frequently proceeds to subsequent atrophy.[1] We have several times alluded to the displacements of the uterus of all kinds, which may be referred to this period. Descensus and prolapsus uteri are especially frequent. The occurrence of these conditions is, however, often already favored at an earlier time (through violent bodily exertion, frequent labors, uterine infarcts, etc.), yet they may also appear in the case of organs that were previously intact. Without doubt there are many causes which, during the climacteric, and especially during the post-climacteric period, concur to bring this about. The retrograde metamorphosis of the uterine muscle, the frequent relaxation of the vagina (aside from partial or general contraction of the canal), the disappearance of the fat-cushion around the vulva, finally the relaxation of the ligaments and the diminished intra-abdominal and intra-vaginal pressure, are conditions that altogether have much to do with it. On the other hand, increase in the original size and weight of the uterus,—which must be of especial significance when, on account of the constipation that is almost invariably present at this time, the pressure of the abdominal walls is greatly increased,—and other influences must all be considered.

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[1] Cohnstein connects with the menopause a circular hyperplasia of the portio, "which by reason of the ectasia of the vessels bears the closest resemblance to hemorrhoidal conditions."

The most peculiar and instructive observation of this kind that I ever made was the following: Miss G. had passed the menopause about ten years before. During her whole life she had been free from all abdominal disturbances, and up to the time in question had felt perfectly well, so much so that of late years she was somewhat incommoded by a rather considerable development of fat. Shortly before she happened to be assisting in the moving of a chest, when she suddenly felt a pain in the abdomen, and at once felt some foreign body between her legs. She came to me soon after and I found a total prolapse of the uterus and vagina, while in every other respect the genitals were intact. The patient was a nullipara and had accordingly a perfectly firm perineum; the vagina, which was already somewhat narrowed through senile contraction, was absolutely free from those changes (hypertrophy, a dry leathery feel of some portions, etc.) which would have pointed to a procidentia of long standing; the uterus was already atrophied, was small, light, and thin-walled, and the portio was absolutely intact; in short, before the accident (with the exception of those changes that were due to advanced age) the pelvic organs were normal in every respect. It is proper to add also that the above-mentioned bodily exertion was not excessive, since the patient had previously undertaken it on several occasions (and probably to a much greater extent) without injury, so that this case cannot be regarded as simply one of those frequent cases of more or less marked displacement of the uterus, resulting from great increase of the abdominal pressure under conditions that are otherwise more or less normal. The only explanation in my opinion lies in this case in the post-climacteric changes which, as above stated, especially favor the occurrence of descensus or prolapse, and here had such a striking influence that in spite of the insignificant causal factor, and the otherwise unimpaired condition of the entire genital tract (there being no increase in the weight of the uterus, previous prolapse of the vagina, loss of tone of the perineum, etc.), there could occur in an instant a complete prolapse of the vagina and uterus. More exactly, then, we adopt this view, in the absence of other explanations, that in our case probably senile changes in the ligaments of the uterus were the cause of the sudden displacement, and in this connection I again call attention to the possible consequences of relaxation of the abdominal walls, previously referred to. The great adipose development in my case might, it is evident, have contributed to cause that relaxation of the ligaments leading frequently "to permanent displacement and abnormal mobility of the pelvic organs." If this is so, then this is a so-called pure case of post-climacteric prolapsus, without the existence of any accompanying predisposition of long standing, due solely to the changes peculiar to the degenerative period of life, of course aided by some causal factor. It is self-evident that the more advanced these changes are, the more insignificant need the latter be; hence, an apparently "spontaneous" prolapse occurring at this time of life will not surprise us, but will at once lead us to infer that the changes in question are extensive, and that the causal factors are so insignificant that they may readily have been overlooked, especially by the laity.

Another point, of no less importance than the one just touched upon, is the influence of the menopause upon existing displacements of the uterus. This applies particularly to those cases in which the menopause exercises a favorable influence upon pathological conditions of the pelvic organs. Not that the principal result is an improvement in the malposition, although that might very well occur, where, for example, the uterus was flexed or bent in consequence of some enlargement, which now disappears, but the favorable influence is shown by the fact that the often distressing symptoms are allayed. As the periods cease, the former dysmenorrhœa is eliminated, and with the diminution in the weight and size of the uterus consequent upon involution of the organ, the numerous disturbances, which formerly year after year formed a subject of complaint, are felt slightly or no more. This improvement in the sufferings caused by displacements after the climacteric is so common, that we may properly consider this as the rule, and confidently reckon upon it. The exceptions are so few that I believe it would be an interesting task to direct attention to them. I have no case in which the disturbances due to a flexion or version of the uterus have continued to any marked degree after the normal climacteric, although after the artificial menopause I once noted this phenomenon of such a peculiar character, that, although the case does not strictly belong here, I shall mention it briefly.

Castration was performed on account of most dreadful dysmenorrhœa, the patient being nervous and hysterical and a confirmed morphine-taker. After the operation she suffered from severe backache, which could not be relieved, but as the uterus diminished in size, the pain grew less, and has now (six years after the operation) reached a minimum, being most marked when she is under nervous excitement. In writing to Hegar recently concerning this case, I expressed my doubt as to whether this could be regarded as simply a periodical hyperæsthesia occurring in nervous persons (having no connection with the malposition), or as the expression of increased sensibility which, nevertheless, has no perceptible relation to the permanent and otherwise insignificant deviation of the uterus, that has evidently diminished in size. I was unable to make use of the shortest way of arriving at an explanation, that is by undertaking to replace the organ, since now, as before, the slightest attempt at mechanical treatment is absolutely intolerable. Hegar himself, in his kind reply to my letter, was inclined to refer the phenomenon in question to certain recollections, impressions which often remain for a long time even after the cause that has actually produced the latter is eliminated.

I have already referred to a certain connection between the climacteric and foreign growths of the uterus. Observations on this point seem to correspond in the main to show that carcinoma of the cervix is especially frequent at about the time of the menopause, carcinoma of the body most common after the establishment of the same. This period of life also seems to exert a decided influence upon the development of the diseases in question, aside from all the other factors which have been shown to be active in this respect. This influence seems to consist in increasing the affection—how, is still unknown.

The menopause exerts an almost exactly opposite influence upon fibrous tumors of the uterus. These frequently undergo marked contraction. Remarkable observations are recorded in this connection. For example, in the case mentioned above, as an example of dreadful hemorrhages, which gave me so much trouble in the patient's fiftieth year, after the bleeding had finally ceased there occurred at once a rapid diminution of a fibroma, which, as was mentioned, was found to be quite as large as a child's head. In watching her advanced anæmia (from which she also fortunately made a speedy recovery) I often saw the woman after that critical period, and at each visit it was only necessary to make very superficial palpation through the abdominal wall in order to make known the constant variations in the size of the growth.[1] Even in the course of a year, I think, the tumor, that formerly extended as high as the navel, could no longer be felt above the symphysis.

With the exception of the puerperium the period in question is the most favorable time for the spontaneous cure of fibroids. The process that takes place consists in fatty degeneration and absorption; it occurs especially in pure interstitial myomata, that are non-capsulated, in a manner quite similar to the change in the rest of the uterine muscle, in consequence of the puerperal or climacteric retrograde metamorphosis (Spiegelberg). The same process occurs to some extent in encapsulated fibromata, but in this case the principal change consists in a diminution of size in consequence of induration and atrophy, and "evident, or at least anatomically-demonstrable remains" of the neoplasm often persist (Gusserow). This induration is frequently associated with calcification.

It is of course extremely important for the physician to bear in mind this mode of termination of the fibrous disease. He is not only thus able to console the patient by holding out to her the possibility or probability of such a spontaneous cure, after the establishment of the menopause, but far more important is the significance of this possible atrophy of the growth in connection with the physician's treatment. We know that a uterine fibroma can delay the menopause and protract it; that furthermore it often gives rise to profuse hemorrhages at this time, and finally, moreover, that it may undergo a retrograde process, so as to completely disappear. This is one side of the picture. It imposes upon the physician a certain passiveness in his treatment, since a delay in the menopause is not usually important in itself, because it is a matter of experience that often patients bear profuse loss of blood surprisingly well, and true palliative treatment consists in opposing the hemorrhages. The opinion that a patient who is near the climacteric should not be exposed to a radical operation, but that matters should be allowed to take their own course in the hope of spontaneous cure, is deeply rooted. This view of the subject is generally the convincing one, and it is doubtless right that it is so. However, sometimes another view of not less importance may be opposed to it. The delay of the menopause from one cause or another may be of decided harm to the patient, since anæmia either before or at the beginning of the menopause may reach such a degree that further loss of blood is to be extremely feared; and finally the local condition, as regards the tumor itself, may awaken the supposition that its further progress must by some means tend with certainty to its easy spontaneous cure. Then it is the physician's duty to consider the question of operative interference; this may arise even when the patient stands upon the very threshold of the climacteric, or it may be when the menopause has actually begun.

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[1] Of course these results were also verified by careful bi-manual examination.

As an example, I shall again refer briefly to a case already noted. When the lady came under my care she was well up in the forties, probably very near her climacteric, and, by reason of the fact that the fibroma had existed for many years, was actually accustomed to severe hemorrhages, as it were. However, I felt it my duty, considering the anæmic condition in which she then was, and in expectation of the impending menopause, to advise strongly the removal of the tumor by an operation. Since I was not allowed to interfere surgically at that time, when the patient was later really at the height of the menopause (when the semi-annual intervals between her hemorrhages really awakened the hope that at each time the end had been reached) I could, notwithstanding, not refrain from representing the necessity of an operation in still more urgent terms. I was again unsuccessful; the patient passed her critical period, literally grazing the edge of the grave, and now, as we have seen, she is not only perfectly healthy, but is also free from her tumor. However, if I had the same case to-day, I would only decide with redoubled earnestness for operative interference. The recollection of what I experienced in employing with the greatest activity every possible agent in order to control to some extent the fearful hemorrhages, and still entered the room each day dreading lest I should find the patient a corpse,—this recollection would make me regard any other advice as criminal sporting with a life that had been entrusted to me. The advances in operative technique are, I believe, too great not to make us reflect upon them when such opportunities are presented to us. Under somewhat favorable circumstances we shall be able to decide almost with certainty whether the spontaneous hemorrhages in question surpass in quantity the amount of blood that it is necessary to lose, or whether it ought not in all probability to be much less. On account of the strength of the patient we should sometimes, after the cessation of the last spontaneous hemorrhage, not feel too great anxiety; subsequent hemorrhages in such cases teach quite well how much the constitution can tolerate at times. Such cases as the one which has been mentioned here, in which the slightest additional attack would certainly have been sufficient to destroy the life which was already in jeopardy, will serve as a proof. We will, therefore, be quite frequently obliged to weigh thoroughly and conscientiously both sides of the question under consideration; this will be more especially the case according as our special knowledge becomes more extended, and we accordingly become more capable of estimating the true significance of every possible variation of these two sides.

I have not yet been able to convince myself that the menopause influences in another way the cure of fibrous disease, *viz.*, by causing spontaneous expulsion of the tumor. As is known, this process is mostly observed in connection with delivery or the puerperal state, but it may occur quite well also at a later period. This is reported in articles that I have recently seen,[1] in the case of a woman forty-five years of age (who had had thirteen children, and for three years had observed a tumor as large as a child's head), and in that of E. Labat,[2] where the patient was forty-seven, and had for six years noted a gradual increase in the size of her abdomen. In the first instance, after bleeding had continued for several months (the flow finally becoming watery and extremely fœtid), for five weeks gangrenous masses of the interstitial uterine fibroid, half as large as the hand, were discharged. In the case of the second patient, who had latterly been greatly reduced by pain and hemorrhage, there came away at first a decomposing, very offensive mass, which was attached to the uterus, and was cut away,—then for ten days small fragments of a similar character were discharged. The patient succumbed to general purulent peritonitis, and the pieces found within the uterus, as well as those that had been previously discharged, showed under the microscope a fibromatous structure (the tumor being sessile). In Zeiss's report[3] of

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[1] Amer. Journal of Obstetrics, 1884, Sept., p. 932.

[2] Prog. Méd. 1880, No. 26.

[3] Centralblatt für Gynäkologie, 1885, No. 22.

Berthod's interesting case, in which a patient, after showing for almost two years most varied, and to some extent inflammatory symptoms, continued to discharge one fibroid polypus after the other, partly entire and partly in pieces and fragments; there is no mention of her age, but I myself have made some similar observations at the time of the climacteric. We certainly cannot prove clearly that (excluding delivery and the puerperium) the menopause may also exert a favorable influence upon the expulsion of fibrous tumors, which, like the shrinking process before referred to, may lead to spontaneous cure. Of course further observations on this point are necessary, or, at least, the material already collected must be specially examined with regard to this question. It seems to me that there is a possibility that this may occur when we consider, as regards pedunculated tumors, that the retrograde metamorphosis which affects the uterus can hardly occur without affecting the strength of the pedicle, hence the greater liability to tearing or stretching of the pedicle until the tumor is "delivered"; moreover, that (as I have convinced myself) deep sub-mucous, or more interstitially situated tumors, may at the climacteric readily (and repeatedly) become pedunculated, which forms a prelude, if I may so express it, to expulsion; finally, that by reason of the commencing friability of the vessel-walls there is a disposition to hemorrhages, which may also take place within the tumor itself, so that the climacteric shrinking of these growths is frequently associated with calcification of the same. Now, hemorrhages and œdematous softening dispose to spontaneous gangrene, and partial calcification in its turn leads to dissecting suppuration, and in the majority of cases indeed to necrosis also (Gusserow). Thus expulsion of the tumor may take place in this way also, in case, of course, the very dangerous character of one of them does not previously lead to a fatal termination (peritonitis or septicæmia).

I desire here to mention more particularly my experience (before referred to) regarding the pedunculation of interstitial tumors which occurs at the climacteric. This, I may say, is derived from only a few cases, but one of these was extremely valuable by reason of the opportunity that I had for making careful observations. I have no doubt that similar observations already exist, but I do not happen to have access to them. I referred briefly to this case before in speaking of protracted climacteric hemorrhages due to fibromata, etc. But the fibrous growths in this particular instance presented the following peculiarity: When I examined the patient on account of her first profuse climacteric hemorrhage, I found, as mentioned above, that the uterus was enlarged to four times its normal size, while the walls were thickened and nodular, the uterine cavity, as measured by the sound, was increased in depth and empty, the cervix was normal, and the os closed. When the bleeding recurred I examined her again. The enlargement and nodular condition of the uterus were the same as before, but the portio vaginalis was softened and somewhat shorter, the os gaped somewhat, and the uterine cavity was filled with a fibroid polypus. Then I thought at once that I was mistaken in my first diagnosis of interstitial fibroid, and that I had to do from the outset with a fibroid polypus, which not only simulated nodular thickening of the uterine wall, but also, by allowing the sound to glide past it, gave a false impression concerning the emptiness of the uterine cavity. Yet, after the removal of the small polypus (as large as an egg), the nodular condition of the uterine wall persisted, and there was no diminution in the depth of the cavity. I could then adhere to my first diagnosis, only it was now changed to extrusion and complete pedunculation of one of those intra-mural nodules. Again, as I was able to convince myself after completing the operation, by careful palpation with the finger, the uterine cavity was entirely empty, and I could (considering the advanced age of the patient) certainly hope, in spite of the small nodules that still remained within the wall, that no further incident would occur. As a matter of fact, for six months after that there was a decided improvement. The hemorrhages became much less and appeared but seldom. During this period I was not obliged to make a further examination. The patient's strength continued to increase, and the long-expected retrograde process with its beneficial results appeared to have begun. Then at the end of the supposed menopause we were again surprised by a violent hemorrhage. It seemed at first as if this was only a climacteric hemorrhage favored by the (already-recognized) presence of the interstitial nodules, as it were, since I was able to convince myself in the most satisfactory manner at the time of the operation that the uterine cavity was empty. However, I at once made an examination, and found, quite contrary to my expectation, that there was another fibrous polypus of the same size as the first. This time I was obliged to dilate the cervix by the bloodless method; then I succeeded in removing it completely, as in the first instance, by means of the wire *écraseur*. The pedicles were in both cases about the thickness of a goose-quill. Of course I was now doubly interested in again making a most careful examination of the inner wall of the uterus. This time I was able to introduce the finger with unusual ease, since it was necessary on account of the operation to dilate thoroughly. Again was the cavity free from any further smaller polypi. The seat of insertion of the one that had just been removed, was exactly at the fundus, while that of the first one was lower down on the wall of the body. As contrasted with the condition found at the first examination, the following circumstance was very striking: while immediately after the removal of the polypus, aside from the breadth of the uterine cavity, I could detect nothing except the normal inner wall, while by the bi-manual or vaginal touch only the remaining intra-mural fibrous nodules could be felt, this time the index finger, while exploring the cavity, at once detected three or four quite hard, hemispherical masses projecting above the normal mucosa, the significance of which, after the observations already made in this case, must at once be evident. All of these intra-mural nodules, which I long ago recognized, undoubtedly tended to grow towards the cavity, and to become pedunculated, in short, to form a series of fibrous polypi like the two already removed.

The case which I have described certainly gave me a fine opportunity to observe this entire process climacterically. Whether we observe the development of two or ten polypi does not affect the value of the observation. The number in my case would certainly increase if the limit is not placed to the process by the attending circumstances. While T. had already suffered for many years with profuse menstruation, so that the opinion was certainly justified that the fibromata were of long standing, this extrusion of the fibrous polypi, as we have seen, began originally at the commencement of the climacteric. Since the process in question, as we saw above, was accomplished, and I removed the second polypus, four months have elapsed, during which the bleeding has been entirely absent, which was never before the case with her. If I add to this that the patient has already entered upon her fifty-third year, both of these facts lead us to infer that her critical period is near its end, and that with it also the process in question must be concluded, since the remaining nodules simply undergo shrinking. Whether this will take place without further phenomena, or whether the above-described occurrence (new polypus-formation and hemorrhage) will again be repeated, the essential character of the matter, that is, the relation of the entire process to the climacteric, is not altered.

I recapitulate briefly the principal facts, which I think may be deduced from this observation.[1] At the time of the menopause there seems to be a tendency for fibrous nodules, that were previously interstitial, to become polypoid. These polypi (more often perhaps than has hitherto been noted) are probably the cause of profuse hemorrhage at the climacteric. After the removal of these fibrous polypi, the subsequent climacteric hemorrhages diminish in a marked degree, even when many interstitial nodules are still present. Since the said polypus-formation may continue to be repeated, after removing thoroughly such a tumor, we must remain watchful, especially if we have been able to convince ourselves of the existence of other interstitial nodules. The newly-formed polypus (often when quite recent) will cause increased hemorrhage; in every case fresh profuse hemorrhages should at least lead us to make another thorough examination of the uterine cavity. After the close of the critical period, this disposition to pedunculation of the interstitial nodules must cease; those which still remain, become shrunken, unless they undergo other changes.

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[1] And which are supported also by observations to be mentioned later.

It would be of especial interest now, to inquire the reason why the climacteric period exercises this peculiar influence that results in the formation of polypi. I should like to avoid an explanation; but if I may give my own unqualified opinion, I would say that it must depend upon two factors, and indeed in the first place upon the fact that the growth of many fibromata is undoubtedly related at times to the climacteric, (to which I shall refer later), and secondly upon the changes in the uterine wall itself, which take place normally at the climacteric. In this way both conspire to assist; the interstitial nodule, that has perhaps remained the same for years, begins to increase in size at the commencement of the menopause, causes protrusion of the inner wall of the uterus in one direction (as I had a chance to feel in the above-mentioned case), and at once acquires a tendency to extend entirely into the uterine cavity, as soon as it meets with the least opposition in this direction. The latter will be the case when that portion of the wall-stratum to the inner side of the nodule is thinner than that to the outer, but especially when the stratum, which is perhaps already very thin, has also undergone tissue-changes by reason of which its original capacity for resistance is diminished. Now, I stated in the introduction that although existing senile changes in the generative organs doubtless scarcely belong to the post-climacteric period, still their early beginning must be referred to the menopause. If this is so, then the first insignificant changes in the uterine muscle will affect favorably the locomotion of the fibrous nodule under consideration, while they allow the necessary use of pressure in the given wall-strata to occur more easily than when these are in an entirely normal condition. I might here add another observation, which really belongs to another department, but which I could not properly omit, before I leave the last-described case of T., since it stands in a certain relation to our subject, and was well observed in that case. It has to do with the question of the "recurrence" of uterine fibromata. It would be quite probable that a case like the one described would, if observed rather superficially, be regarded as an example of such a supposed recurrence. We investigate what is apparently a violent climacteric hemorrhage, find a fibrous polypus the size of an egg, and remove it. The examining finger subsequently proves that the uterine cavity is completely empty and the matter seems to be ended for good. Six months later, another severe hemorrhage takes place, and another fibrous polypus of the same size is discovered; what prevents this occurrence from being called an undoubted "recurrence?" As opposed to this view my case actually forms a new proof against it.

Not to speak of the different places of insertion, which in this instance happened to be demonstrable, I could trace exquisitely by the various examinations, the successive transformation of the long-existing (and long-recognized) intra-mural nodules into polypi.

According to Gusserow, the so-called recurrence of fibrous tumors is more often explained by the fact "that after removal of a large tumor, others after a certain time attain such a size that they again give rise to trouble, rather than that smaller ones already present develop further in another way (sarcomatous degeneration, subsequent growth of a fibroma that had been only partially removed, etc.) In this way he explains in the simplest way Kidd's case[1] of a young woman, from whom in the course of a few years twenty-nine different fibrous polypi were removed. In many such cases the transformation of the intra-mural nodules into fibrous polypi, which was directly proved in one instance, would render still more readily conceivable the real existence of this supposed recurrence.

As regards my own additional observations in this direction, up to this time I have had no other opportunity of following out a case so thoroughly, but I have repeatedly met with a confirmation of one or the other point in our previous analyses. The spinster A., by reason of profuse hemorrhages at the beginning of the menopause, had already arrived at a state of profound anæmia. I removed from her at one operation three fibrous polypi the size of nuts, and found afterward that, although the uterine cavity was empty, there were several nodular protuberances in the wall of the body, representing other intra-mural fibromata, which seemed to me, by reason of their projection outwards being more especially marked, to tend principally to a sub-serous development. When I saw the patient again about a year later, I found that the hemorrhages had returned only at intervals, and were much less profuse, but that they were succeeded by extremely serious disturbances of another sort, a feeling of weight and fullness in the abdomen, backache, vesical tenesmus, etc. As I supposed, I found now that the isolated fibrous nodules had actually grown to a remarkable size, but that they all seemed to have a tendency to extend outward. They could be felt with especial ease through the anterior and posterior fornices, and were, by reason of their decided extension downward, to be regarded as the direct cause of the above-mentioned troubles. Notwithstanding, violent hemorrhages again occurred, and a year later I was obliged to remove a fibrous polypus as large as an orange (being obliged to incise the cervix in several places) and a second the size of a nut. The uterine cavity was subsequently again found to be entirely empty, and the nodules were found extending outward in about the same way as before. The hemorrhages subsequently became less profuse, and have remained so until the present time, that is, for six months more. It is impossible to say what will finally be the condition of this patient, who is now in her forty-eighth year, and still menstruates.

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[1] Dublin Journal, Nov., 1875, p. 456.

Here again there seems to have been a formation of polypi at the menopause (at least the profuse hemorrhages were certainly of earlier date than the patient reported the first time), and the consequence of removing the polypi, as regarded the hemorrhages, was again extremely favorable, in spite of the remaining intra-mural nodules. On the other hand, the case proves what I stated above with regard to the "recurrence" of polypi under such circumstances. There was only a partial tendency among the single interstitial nodules, as I learned by experience, to grow outward. Finally, I would again call attention here to the marked increase in size, which was noticed in the fibromata in this case, also, at the time of the climacteric, and which manifested itself by the series of subjective disturbances referred to, and could be demonstrated on examination.

Mrs. H., about fifty years of age, was at her home, pronounced to be incurably affected with cancer. She suffered for many months with hemorrhage and fœtid discharge, her mucous membranes were perfectly blanched, and there was extensive œdema. An internal examination revealed a disintegrating tumor larger than a man's fist, which filled the entire vagina. By careful palpation, however, the intact edge of the os could be felt, as well as the pedicle of the tumor, reaching up into the uterine cavity. I removed the tumor, and found that it was purely fibrous in structure. A subsequent careful examination of the uterus revealed no further abnormality, and the woman recovered from that time. The hemorrhages, too, were at the same time permanently cured. Here, too, the climacteric was complicated by the formation of polypi. The polypus was in this case the sole cause of the continued bleeding; when it was removed the former was simultaneously and forever cured. As regards the above-mentioned subject of "recurrence," the return of a similar formation could be excluded at the outset, as well on account of the complete removal of the first one, as in consequence of any other sub-mucous or interstitial fibroma, which could be shown with sufficient certainty. The subsequent history of the patient proved the correctness of the diagnosis.

So far as we have yet studied the subject, the climacteric generally exercises a favorable influence upon fibrous tumors. However, the number of observations is increasing, in which the changes referred to which often produce a cure are waited for in vain; and in which, at the climacteric, or after it, fibrous growths assume a more unfavorable character than before. In my opinion, this too is a chapter in pathology which ought to receive zealous attention. Of what profound importance it would be if our knowledge in its bearing upon prognosis could be somewhat extended, and in this way the above-mentioned doubts of the physician regarding such patients would, to some extent at least, be dispelled.

The most important point of all is the circumstance to which attention has already been called in the former pages, increase in size of fibromata during and after the climacteric.

As Lawson Tait,[1] for example, observed "that the growth of the fibrous tumor does not cease in every case with the cessation of the menses," and he operated upon four women who had passed the menopause, and suffered with rapidly-growing myomata, and Schorler[2] has reported four histories which show the exceptional growth of fibro-myomata after the menopause, — I have myself on some occasions been able to demonstrate such a condition. I have under observation at the present time a Mrs. P., aged about fifty-six, who was childless, ceased to menstruate at forty-five, and came to me for the first time fifteen months ago, on account of an abdominal tumor which she had herself noticed two years before. I found at that time a sub-serous uterine fibroid, which extended upward to within two finger-breadths of the umbilicus, rested on the left side within the iliac fossa, and on the right extended to a point midway between the spine of the ilium and the linea alba, while below it caused quite a prominent protrusion of the posterior vaginal fornix. The tumor then caused absolutely no symptoms. A little more than nine months later the tumor extended a finger-breadth above the navel, its other dimensions remaining nearly the same as before, and caused various symptoms by pressing against the diaphragm. Three months later it showed a marked enlargement in all directions, while the subjective troubles (dyspnœa, nausea, etc.) increased still more, and to these were added further pressure-symptoms in the shape of extremely severe pains in the legs. There was an entire absence of any factor which would lead one to infer a change in the tumor itself (such as localized softening or fluctuation, sensitiveness on pressure, increased temperature, disturbance of the general nutrition, etc.), other than a simple increase in the size. The tumor always presented the same firmness and insensitiveness at every point, and the patient's troubles, although they were unpleasant and painful, nevertheless were only confined within the limits of pressure-symptoms. Now the lady, by reason of the further increase in all her symptoms, has for some time entertained the idea of risking a radical operation. I have seen two or three other women with large interstitial tumors which continued to grow in spite of the establishment of the menopause, but the time during which I was able to observe them was too short to make the cases of value in this connection. In the case of H., which I described before, I was able to recognize in the clearest manner the growth of the fibrous masses during the climacteric period; and in the case of T., also, in which I had such an excellent opportunity to trace the transformation of the interstitial nodules into fibrous polypi, the first ones may indeed have produced those evident projections on the inner wall of the uterus, during the climacteric, simply by increasing in size.

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[1] Trans. London Obstet. Soc., Vol. XXV.

[2] Zeitschrift f. Gynäkologie u. Geburtsh., 1884, Bd. XI. Hft. I.

This growth of fibro-myomata during, or after, the climacteric, which, as we have here recognized it, takes place without any change in the original character of the tumor, of course is rather opposed to the other retrograde processes which take place in the entire genital tract at this period, but especially to the shrinking processes observed in tumors of an entirely similar character in other cases. In the present state of our knowledge, it is impossible to recognize the true cause of the occasional occurrence of such an exception. We may perhaps throw light upon this subject subsequently, by observing next some parallel processes that take place in other parts of the body at this time. It may at least become clear how we can classify, so to speak, the occurrence in question. The closest comparison that can be instituted, in my opinion, is that with the increase in size of the uterus, which, as I mentioned in the introduction, precedes in many instances the retrograde metamorphosis of this organ. This increase in size depends, in all probability, merely upon a temporary congestion, and hence stands in a certain relation to the various localized congestions in other organs that are characteristic of the menopause. If, now, we suppose that there is such a local increase in the supply of nutritive material, which is furnished to a fibroma that has existed for a year, but has hitherto remained of the same size, then this supply must be sufficient to cause further development of the tumor, that is, to form cell-elements similar to pre-existing ones, just as at other times the simple withdrawal of nourishing material (as in treatment by ergotin, cutting off of the blood-supply by operative interference, etc.) producing diminution in the size of the growth. At least it seems to me not improbable that, in most of the cases in which an increase in the size of a fibrous growth is recognized before each menstrual period, a true enlargement of the same certainly results, if equalization is effected each time, by the influx of menstrual blood; and that accordingly the mere absence of this equalization at or after the climacteric, may always induce a further development of the tumor, when in any way increased congestion is produced. As we shall see later, these localized congestions at the time of the menopause are much less dependent upon an absolute plethora of the organism,—as has been quite generally admitted hitherto,—as upon a change in the activity of the vaso-motor nerves. This is of great importance in its bearing upon the question at issue, inasmuch as in this way it becomes further evident how it is that at the climacteric, at one time atrophy and at another increased development may take place in fibrous tumors that are quite similar in their structure. If the local increase in the blood-supply were due only to the influence of a general congestion, caused by the cessation of the menses, then this must certainly take place in all normally nourished women after the menopause, and an existing fibroma would always begin to grow. But if the nervous system plays the principal part, whatever the general state of the circulation may be (compare the congestions in anæmic women), then the actual individual differences in this respect at once seem to be conceivable. After what has been said, then, the growth of fibrous tumors at or after the menopause, in isolated cases, should be attributed to local congestion, produced by individual changes in the innervation, and would then belong among the consequences of the vaso-motor disturbances due to the climacteric. As regards the still rather obscure subject of the transformation of fibrous into fibro-cystic tumors, it is often difficult to decide whether the menopause has any influence in this direction. The idea that the varying changes in the circulation occurring at this time may be directly connected with the occurrence of ectasiæ of the lymph or blood-vessels, is certainly worth entertaining. It is also not entirely without significance that Hegar[1] found in a series of fifty-one cases of fibro-cyst, that they were of most frequent occurrence between the ages of forty and fifty (in twenty-three cases); seventeen occurred between thirty and forty, the other eleven at an earlier or later period. I myself recall a case in this connection, in which the principal changes also occurred at the time of the climacteric. Mrs. L. suffered for about thirty years with an interstitial fibromyoma, which apparently dated from the time of her second (and last) pregnancy. During the early years a Vienna physician affirmed that it was about as large as a man's fist. Throughout the entire intervening period it is said to have undergone no marked changes; only the menses, which were profuse, since she began to suffer, continued to increase in amount as time went on, and eventually there was essentially a condition of anæmia, in consequence of which the patient felt very badly. Towards the end of her fortieth year the tumor underwent a striking enlargement, the entire set of severe pressure-symptoms developed, and the climacteric hemorrhages (which were then very profuse, but now appear at intervals) gave her different physicians considerable to do. When I first saw the lady she was in the middle of her fiftieth year. The question which was presented to me then related to the great pain on the right side, which had awakened the suspicion of local peritonitis. I found the abdomen much enlarged, the tumor occupying the entire pelvic cavity, and extending above the navel, while it was partly of firm consistence, but partly fluctuating. Besides, in the right hypogastrium, there projected prominently such a cystic portion with a smooth surface, and gave rise in that region to that severe localized pain, perhaps by reason of the excessive distension of the peritoneum. This condition, in connection with results of the examination, which I have described most accurately, left no doubt as to the diagnosis,—cysto-fibroma,—but it can readily be imagined that I only established this with difficulty, since, as in most cases, here also the evident fluctuation constantly led my colleagues to infer the presence of an ovarian cyst. The proposal of a radical operation was not accepted, and we were accordingly compelled, on account of the pains, which became unendurable as the tumor grew larger, to resort to puncture at that spot, in spite of the slight results which were to be expected, and the well-known danger of this procedure under such circumstances. On the first occasion we obtained scarcely a liter of clear, yellowish fluid, and no evil consequences followed; more than that, a decided amelioration of the local pain was noted, but unfortunately, as it appeared this lasted only a few days. A second puncture, undertaken some days later, at the urgent request of the patient, furnished a still smaller quantity of bloody fluid, containing fragments of tissue, and this time there was absolutely no relief from the pain. Whether wisely or not, finally laparotomy was permitted, and was performed by Professor R. The removal of the growth was rendered extremely difficult by the most extensive adhesions, as well as by the great friability of its walls, yet he succeeded in detaching the entire tumor, which consisted of large and minute spaces, and was mostly sub-serous, and in closing the large uterine wound carefully. In spite of the favorable course of the case at first, the patient succumbed on the fifth day with evidences of peritonitis.

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[1] Dissertation, Zürich, 1874.

If we were obliged to speak with the greatest reserve with reference to the transformation of fibromata into fibro-cysts, and to point to the influence of the climacteric in this direction simply as a possibility, its influence upon another process—the transformation of fibromata into sarcomata—must be described quite positively as a fact. It must be this process to which G. E. Sussdorff[1] refers, when he says: "Although most of the functional and organic affections of the female genital organs decrease in severity after the menopause, in a considerable number of cases exactly the opposite occurs, so that a benignant degeneration may even become malignant." This process appears as a frequent occurrence in the practice of every busy physician, if only attention was more generally directed to it. Its slow course, the fact that the symptoms are often not urgent, the appearance of intercurrent conditions, which in one way or another divert the attention, the lack of opportunity for extended observation, or, finally, the absence of autopsy (which can indeed seldom be obtained), all unite in bringing it to pass that many a case escapes notice. I myself, at least, after what I have observed, have no longer any doubt that the given changes in the character of those growths during or after the establishment of the climacteric, are of far more frequent occurrence than is commonly supposed. In deciding upon the cases observed, I was of course confronted with the difficulties just mentioned. The patients were on a journey, or came from different parts of the country, and could, therefore, not be seen again. Others were placed under the care of other physicians for intercurrent affections, etc. I often had an opportunity to make a positive diagnosis in individual cases, yet I could not confirm this; at other times I learned that my opinion had been correct, but in the place where they were, there was not such interest taken in the matters that the value of the details or of the case itself were properly estimated. As I am aware, much was in this way lost to the general sum of knowledge. But by diligent questioning afterward, I could always supply data, and could, to my own satisfaction at least, supply the proof of the relative frequency of the occurrence in question. My fellow-specialists, by reason of similar experiences, have personally arrived at the same conclusion. It is due to the difficulty of following individual cases throughout their entire course that the statistics are still comparatively so small. I would mention the frequency of the process in question, simply because it seems to me as if sufficient stress had not been laid upon it hitherto.

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[1] N. Y. Med. Record, 1878, Dec. 21.

It has long been proven that the process stands in general in close relation to the menopause. A collection of sixty-two cases of sarcoma (fifty-six by Rogivue from the literature, four observed by Simpson, and two by Gusserow), of which fourteen were referred to the period between thirty and thirty-nine, twenty-six between forty and forty-nine, and fourteen between fifty and sixty, leads Gusserow to make this reserved expression of opinion: "If any conclusion is permissible, it would certainly appear from this that the climacteric period of life, just as in the case of other malignant uterine growths, shows a certain predisposition to sarcoma of the uterus." In another place, however, this excellent observer expresses himself thus positively: "We must suspect the development of a fibro-sarcoma, or the transformation of a fibroma into the former, whenever a fibroma appears just at the climacteric, or whenever a growth of this character, that has hitherto been small, and has given rise to slight symptoms, or to none at all, at or after this period increases in size, or produces marked symptoms." Finally, he says: "Another characteristic sign of sarcoma may be presented by the abnormally rapid growth of the doubtful tumor, especially, again, if this takes place during the climacteric period."

It is well-known that Rokitansky and Virchow hold that the given process of transformation in fibromata (the more or less extensive compression of the fibrous or myomatous structure, by a rich growth of round, less often spindle-cells) is the most common way in which the sarcoma is formed; far less frequently it developes primarily, and others (Kunert and Schröder) go so far as to assert that all fibro-sarcomata are fibromata that have undergone sarcomatous degeneration. Why it is, however, that the menopause should constitute the favorable period for the transition of homoöplastic to heteroplastic growths is entirely beyond our present knowledge. We had occasion in former pages to refer to the frequent development of carcinoma at the climacteric and post-climacteric periods. We have in this closely-allied process merely another link in this fatal chain before us, and this transformation that takes place in fibrous growths represents perhaps the most exaggerated nutritive changes, in which the change of innervation during and after the climacteric finds expression.

I have recently observed the following cases: Mrs. W. suffered for several years with a sub-mucous fibroid and declined an operation, in spite of repeated hemorrhages. Since her fiftieth year the tumor has increased enormously, also the hemorrhages, while there is pain, emaciation, and a watery discharge. When I examined the woman at the beginning of her fifty-third year, the tumor extended to the navel, and protruded from the os, filling the vagina; the portion that could be felt was very soft, but not broken down. An operation was declined, and the woman returned home. Mrs. H. had for some years a uterine fibroid as large as the head, but so few symptoms that she married (?). Last year (when she was in her forty-ninth year) I saw her again, when she presented a cachectic appearance, and the tumor was much larger, softer, and very painful. Her physician tells me that her case is now hopeless; she is extremely anæmic, suffers greatly, and has hemorrhages and a fœtid discharge. Mrs. G. was examined by a gynecologist twenty years ago, and was said to have an interstitial fibroid. Towards the end of her fortieth year, the growth increased in size, and the pressure-symptoms were aggravated. I saw the patient when she was about fifty, when she complained of severe pains, hemorrhages and a constant watery discharge; on examination, I found that the abdomen was filled with a solid tumor. The os was dilated, and on introducing the finger I felt a soft tumor. At the autopsy the growth was found to be cancerous. I have no doubt that in these three cases of complication of the menopause there was sarcomatous degeneration of pre-existing fibro-myomata.

Finally, we must consider the relation of the climacteric to certain pathological conditions of the ovaries, although as yet nothing positive can be stated on this point. As introductory to this, I would refer to a fact, of which Cohnstein makes mention in his gynecological studies,[1] although this does not relate to the climacteric itself, but only to the early disappearance of the menstrual flow, or to an apparently premature menopause. The normally-persistent function of the ovaries in such cases of early menopause "may show itself by menstrual molimina, and may produce inflammatory and congestive processes in the ovaries and their vicinity, a point which, in Cohnstein's opinion, has hitherto been too little considered in the etiology of ovarian neoplasms, but is important pathogenetically like chlorosis (Scanzoni, Breisky), in which in consequence of too slight menstrual congestion and consequent persistent dehiscence of the follicles, hypersecretion of the latter occurs. The periodical congestion, which is relieved neither by uterine hemorrhage nor by rupture of the follicles, leads through increased blood-pressure to chronic hyperæmia of the ovaries with hemorrhages into the follicles, which result in cyst-formation. Klob and Klebs found blood, bloody fluid and blood-crystals within the small cysts that had developed from follicles. According to Smith, in countries where venesection is practised quite frequently (as in Spain at the present day), ovarian tumors are observed more rarely; this may be due to relief of the ovarian congestion. Amenorrhœa is one of the most common menstrual disturbances observed during the development of ovarian growths (compare cases reported by Spencer Wells, Köberle, and Peaslee). Finally, the unquestionable influence of the menstrual function in the etiology of ovarian tumors is shown by the absolute increase of the affection between the twentieth and fortieth years. On the supposition that, aside from the supposed significance of the last-named symptom (amenorrhœa), we must also explain those cases in which this menstrual disturbance is to be regarded as a result of the already existing destruction of the normal ovarian parenchyma, I mentioned briefly Cohnheim's theory of development, since from it, as has been said, we may arrive at some definite conclusion with regard to the apparently premature menopause. If the true menopause has occurred, we must, in spite of the fact that ovarian cysts are known to develop at any age, think above all of the fact that there is now less tendency to these growths. In harmony with what has been stated, is apparently to be regarded the development of certain neoplasms with the cessation of the menstrual congestion. Olshausen lays stress upon the rare occurrence of cystomata after sixty, and regards the period of sexual activity (from twenty to fifty) as the most liable to them. A collection of cases (reported by Peaslee, Wells, Köberle and Clay), 926 in all, seems to be significant in connection with this period; of these 266 occurred between the ages of twenty and thirty, 298 between thirty and forty, 213 between forty and fifty, and 157 after fifty. It is quite evident from this that the period of sexual activity is especially prone, but that after the menopause the tendency is decidedly less. By further statistics Olshausen shows that married women are more liable at a later period than unmarried, the former being "more disposed between thirty and fifty, and even after fifty," but, as we asserted above, they show a certain diminished tendency after the menopause, since between thirty and thirty-nine there were 153 cases, between forty and forty-nine 154, and above fifty 135.

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[1] Wien. med. Wochenschrift, 1878, No. 20.

Although we can, therefore, assert quite positively, that the period of the climacteric lessens the tendency to the development of ovarian cysts, it is impossible in the present state of our observations to give a satisfactory reply to the second question concerning the influence of the menopause upon already-existing cystomata. I have searched in vain the literature to which I have access for some information bearing specially on this point, and the few useful observations do not bring us to a definite conclusion in any direction. Yet, the question is certainly worth considering. The observations of a single individual would, of course, not be sufficient, a general interest must be awakened in it, in order to obtain any useful results from abundant clinical material. Investigations in this direction cannot be fruitless. Pregnancy and parturition often cause changes in co-existing tumors. It is known that the menopause often produces a similar result; such an effect must sometimes be observed in cystomata. A marked increase in the size of ovarian tumors is frequently observed during pregnancy (Spiegelberg, Routh, Lever, etc.), and this is certainly often noted in the case of cystomata during the climacteric.[1] This was explained on the supposition that each time there was an increased supply of blood in the vessels within the adhesions, but a larger number of observations in this direction is necessary, in order to prove that this growth is sometimes really peculiar to the climacteric or post-climacteric period. On the other hand, it is well-known that a retrograde metamorphosis of certain abdominal tumors is frequently induced by the menopause. Although the "involuted, shrunken cysts" (Rokitansky) hitherto discovered in old women, were thought to have been changed by torsion of the pedicle, it is always possible that this atrophy and partial calcification even in cystomata, is produced by the menopause alone.

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[1] This occurred also in the case which formed the basis of my article on "Spontaneous Rupture of Ovarian Cysts." The tumor, which was first discovered at the beginning of the patient's fiftieth year, grew during the (late) climacteric until it reached the size of the head, and it steadily increased in size after that time till in the course of a few years it distended excessively the entire abdomen.

Anæmia of the afferent vessels (when vascular adhesions are absent) causes the same result as successive torsions of the pedicle; this latter form of torsion can alone be supposed here, since this results only in their shrinking (shrivelling of the walls of the tumor, with absorption of the contents[1]), while more rapid torsion leads to hemorrhage into the cysts and rupture, and complete strangulation of the arteries to gangrene. Besides, we know that torsion is not necessary in order to produce the effect which we are considering. Spencer Wells also observed atrophy of an ovarian tumor merely through obstruction of the circulation in the pedicle, in consequence of surrounding adhesions, a process that might occur still more readily in consequence of certain nutritive changes during, or after, the climacteric. Olshausen, also, suggests (without special reference to the menopause) the possibility of the secretion of fluid being arrested in consequence of the destruction or fatty degeneration of the epithelial lining of the loculi, without any torsion. By reference to a series of clinical cases of hydrops folliculi, it seems to him to be undeniable that this arrest of the secretory function may persist for years "and may in fact, be permanent." It remains to be shown whether this cessation of the secretion and consequent diminution of cysts, even though it may be slight, does not frequently date from the period of the climacteric. Reasoning from analogy, as I have remarked, I should think that this occurrence is not improbable. There is another accident which deserves our attention, *i.e.*, the rupture of cysts. In a paper on "The Spontaneous Rupture of Ovarian Cysts,"[2] I mentioned those changes in the cyst-wall which increase their friability to such an extent that spontaneous rupture may occur, even when there is a complete absence of external causes. I noted in this connection inflammation of the inner lining (in consequence of injury, strangulation of the pedicle, etc.), thrombosis of the vessel-walls (Spencer Wells, Mayne), fatty degeneration, hemorrhage into the cysts, with infiltration of blood into the wall (Spiegelberg), and finally thinning of the wall of the sac by proliferating papillomata (Rokitansky, Spiegelberg). As regards fatty degeneration in particular, I would mention here that Spencer Wells—who, in a series of 300 ovariotomies, operated in 24 instances after the cyst had burst, and its contents had escaped into the peritoneal cavity—describes this as the usual etiological factor in such cases.[3] If it is true that, as before-stated, the tendency to fatty degeneration of the cyst-wall is increased at the time of the menopause, then the disposition to spontaneous rupture of pre-existing cystomata must accordingly be regarded as greater at this period. The occurrence of a more advanced grade of fatty degeneration (according to Spencer Wells the process begins in the epithelial layer, extends to the adjacent strata, and sometimes involves the entire thickness of the wall[1]) would be sufficient to explain the accident. It would be interesting to examine this point. The case of spontaneous rupture described in my paper occurred in a patient of quite advanced age. When the first rupture took place, the patient was already seventy-one years old, and had been tapped several times. The case is hardly of value in this connection, but I may by describing it call attention to a circumstance which I would not delay to mention.[2] It frequently happens, as in the case of this patient, that the point of rupture again closes, the sac refills, and laceration and refilling are again repeated. We must always bear this possibility in mind in deciding upon individual cases. Under certain conditions (to which I have likewise referred in the article in question), the symptoms following rupture may be quite insignificant, and may perhaps be overlooked or misunderstood in recording the history. Cases of intact (that is, unruptured) cyst can accordingly be considered in a negative sense, after somewhat prolonged and careful observation. In all positive cases we must take into account spontaneous rupture. In noting the greater percentage of such cases in younger patients, we must take into account the greater tendency to the disease during this period, the number of cases that become unavailable for observation by reason of operation, and, finally, the smaller number of cases observed in advanced life.

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[1] Spencer Wells, "Diseases of the Ovaries," p. 84.

[2] Mittheilungen der Aerzte in Steyermark, 1882.

[3] "In these cases the common form of degeneration is that into fat. This indeed, is the most commonly observed stage of retrograde change in these tumors, the primary one being that of an anæmic condition of the fibrous tissue." Op. cit., p. 80.

Dermoids, which begin in fœtal life, as is known, generally give rise to no symptoms for a long time, and first come under observation in consequence of the changes that take place in them at certain periods. Puberty favors their growth, and the lesions produced by parturition lead to suppuration and necrosis, but the menopause does not seem to exert any special influence upon their growth. They have been accidentally discovered at the autopsy in quite old women, in whom they had given rise to no symptoms throughout their entire lives, not even at the climacteric.

Of the solid ovarian growths the comparatively rare fibromata generally occur in early life. According to Leopold, of thirteen patients, five were under thirty. They tend to grow slowly during the climacteric as well; yet Klob found an ovarian fibroma as large as a child's head in a woman of fifty-eight. The opposite retrograde change, such as was described in uterine fibromata after the menopause, is generally absent in them, by reason of the small number of muscle-elements; Spiegelberg and Leopold affirm that it never occurs. The frequent calcification of the exterior of these tumors must be regarded in many cases as a post-climacteric change.

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[1] Op. cit., p. 81.

[2] I recently observed the spontaneous rupture of a cystoma in a woman of 56, who had passed the menopause.

Olshausen[1] gives a table of 17 cases of sarcoma of the ovary (Leopold's, Winckel's, and four of his own cases), of which 3 developed before twenty, 4 before thirty, 8 between thirty and forty, and 2 in the sixty-second and sixty-sixth years. Small as these statistics are, they show the even distribution of the disease among different periods of life, and they at least show that there is no tendency to appearance at the time of the menopause. Reference has repeatedly been made to the particular predisposition to this affection in early life, a tendency which, as regards carcinoma, Virchow considers as even of diagnostic value. Finally, as regards carcinoma of the ovary, we are also indebted to Olshausen[2] for a valuable collection of his own and others' cases. In this it is noted that 4 patients were under twenty, 12 between twenty and thirty, 7 between thirty and forty, 12 between forty and fifty, and 13 were fifty or older. A pretty positive conclusion can be drawn from this series of 48 cases. On the one hand, it supports the view entertained by Olshausen himself, that there is a certain predisposition to this affection in early life; he shows that of the patients who were over twenty, the majority had not passed forty, "unquestionably at and just after the age of puberty." On the other hand, this table proves decidedly that the time of the menopause also disposes towards this disease, which agrees with Virchow's view before-mentioned, that the tendency in question also belongs to later years. It follows naturally from Olshausen's assertion, that the diagnostic value of this fact is limited to sarcoma; the youth of an individual by no means excludes the possibility of ovarian carcinoma in a given case, since it has even been observed in children. But we are especially interested in the second period of life, in which a disposition to this trouble is especially noticeable; this is without doubt the period during and after the establishment of the menopause. If now we remember the relative frequency of this affection as compared with all the other solid ovarian growths, we have here another important link in the chain of noxious conditions, which may result from the menopause. Since we also saw before, that carcinoma of the corpus uteri generally occurs at a somewhat late period, and that carcinoma of the cervix has a preference for the time of the menopause itself, and that as regards carcinoma of the ovaries, too many cases show the first traces of the disease after the establishment of the change, there appears to be a certain definite relation between all these affections and the period of life which we are studying. We shall see later how various other still more common "climacteric conditions" persist for years after the normal cessation of the menses, and we shall be justified in assigning the term "menopause" to a more extended period than that which it hitherto has been the custom to allot to it. When thus considered, a whole series of abnormal changes will be included rather under this head (especially most of the troubles mentioned, whether they appear a few years sooner or later), and we may formulate so much the more positively the law that the tendency to malignant disease of the pelvic organs is increased at the climacteric. Finally, I would call attention in this place to a fact that is explained by the intimate relation between the organs in question, *i.e.*, the frequency of malignant disease of the breast, at this time of life. According to Cohnstein[1] the direct influence of the climacteric upon the development of carcinoma mammæ can be shown more clearly than in case of cancer of the uterus.

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[1] Loc. cit., p. 422.

[2] Loc. cit., p. 435.

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[1] Virchow's Archiv. für Path. Anatomie, Bd. 61, p. 104.

CHAPTER V.

PHENOMENA OF THE MENOPAUSE IN THE BODY IN GENERAL.

WE turn now to the phenomena to which the menopause gives rise in other portions of the body. The most varied forms are presented in this field, such as repeatedly perplex the most careful observer by their novelty. However, they may be entirely absent; in fact, hardly any two cases are alike. While many women pass this period without noticing any change in their former condition, and are conscious of the occurrence of their change of life only by reason of the absence of the menstrual flow, others suffer for years with one affection or another, or there are a whole host of lesser or greater troubles, by which they are persistently or alternately affected. It is to be noted that commonly few complaints are made about certain conditions that are often quite annoying; these are the most frequent disturbances which are known to the women themselves, partly from hearsay, and partly from the observation of others, and are, therefore, quietly accepted as self-evident and necessary. We are consulted regarding such conditions only when they exceed the ordinary bounds. In order to obtain a correct view, it will, therefore, be necessary for the physician to question each patient very thoroughly.

One of the most essential changes at the climacteric period, which will hardly escape the attentive observer, is that of the woman's psychical condition. Vagaries in this direction are generally observed by associates, and by the physician if they become marked. The slightest forms usually escape the notice of all; the women themselves, on being questioned on this point, give the first information regarding the change in their characters, which had for some time completely escaped them. The question to be asked in this connection naturally does not relate to this or that positive change of disposition, but may be a very vague inquiry regarding the quality of dispositions. It is quite striking what a marked similarity usually exists between the individual answers obtained. These nearly always give evidence of a certain lowering of the vital energy, if I may so express it. The daily duties lose their interest, and there is a certain indifference towards everything, or everything seems to the patients to be more difficult and wearisome than it used to be; they are often surprised at finding themselves plunged in a certain stupor or dejection, while they are troubled more than before with the consciousness of their own imperfections, and the transient character of every pleasure, and with forebodings of sickness and death, etc. Some think that they have become forgetful, while others fear that they are no longer able to perform this or that bodily exertion; others, again, are disquieted on account of the possible loss of their property, while nearly every one experiences, consciously or unconsciously, a certain amount of ennui, more or less of a disposition to peevish melancholy. These changes in the disposition are usually confined to certain times in the day; they are often absent for days and weeks. If the menses have not yet entirely ceased, but still recur now and then, there is sometimes manifested a certain connection between the change of disposition and the periods (the peevishness generally appears during the days preceding the beginning of the flow), yet this relation is often entirely absent. The psychical vagaries in question frequently begin a long time before the first irregularity in menstruation is noticed, often appear at and after the time of the irregularities, without any relation to the menses, and continue for years after the cessation of the flow. This is true of another form of psychical disturbance, which in my experience is more rare, which produces in women a certain increased irritability, impatience, restlessness, tendency to outbursts of anger, etc.

The importance of the climacteric as an etiological factor in the development of actual mental maladies has been clearly affirmed by distinguished authorities. According to the deductions of Tilt, Krafft-Ebing and Meynert, the connection between mental disease and the menopause is extremely common. It is sufficient for the framework of our argument to have alluded to this latter fact. But I should like to discuss another point also. According to Briérre de Boismont, Esquirol and Griesinger, the climacteric generally exerts an aggravating influence, but sometimes improvement, or even perfect cure, occurs at this time. I saw an example of the latter result in a case which was complicated by delusions of persecution. The woman is now just at the commencement of her menopause, but mentally she is perfectly sound again. If we see actual mental affections develop in consequence of the menopause in women who were healthy, or at the most nervous and excitable, and then again existing psychical disturbances become worse at this time, or change for the better until they are completely cured, we must from this draw the conclusion that the climacteric may lead to marked changes in the psychical condition of the patient in question. This applies to actual mental affections, but it applies in the same way at least to the vagaries of the slighter and more insignificant kind which interest us here, and are almost invariably observed. As we have remarked, there is usually a sort of outspoken depression, often expressing itself by a tendency to weeping, but even at the climacteric a healthy, contented, even gay disposition may be present, even where this was not hitherto the case. What I would call attention to here is quite different from this quality of disposition, especially the transformation of the psychical condition of the individual by the menopause, which is apparent even in these slight variations. I claim that this often merely slight change in the character is quite a characteristic symptom of the menopause. Without wishing to bring forward a new explanation of this phenomenon, I should like to be allowed to say a few words regarding the point in questio

We find that in works which discuss this subject, two factors are generally taken into account, first the processes in the sexual sphere that result at this time (much importance is attached especially to the sudden cessation of the menses), as well as certain simultaneous pathological changes that occur in these organs, such as flexion, catarrh, erosions, etc.; secondly, the reflexions of the patient caused by her condition, meditations on the loss of youth and sexual power, anxiety in view of the dangers of the climacteric, etc. Without doubt some importance is to be attached to this factor, and one or the other is often quite striking. In my opinion, it is necessary to remember the following facts:

(1). In two different women the phenomena depending upon sexual causes (irregularity of the menses, etc.) may be identical, and both may be nervous, yet in one there may be a very slight, in the other an extremely serious change psychically. Because of the sudden cessation of the menses, on which so much emphasis was laid, I have had several cases in which the psychical alienation was really not so marked as before; sometimes under such circumstances, it was hardly noticeable. Abnormalities of the genitals frequently occur at other times without affecting the mind; if they are found at the climacteric, we can not be sufficiently cautious in estimating their etiological value. Successful treatment of the sexual trouble, even if it is accompanied by relief of the psychical disturbance, need not be directly capable of explanation; the latter may be transient, and it frequently terminates without any local treatment. The affection of the genitals is often cured, and the psychical disturbance nevertheless does not appear. It can not be denied that there is some truth in the supposed sad thoughts about the beginning of old age, the possibility of bodily suffering, etc., and accordingly the depression caused by them can scarcely be regarded as abnormal. But the woman's sensitive nature is often subjected to infinitely more of a shock, without any such change in her psychical individuality resulting, and on the other hand, it does not often happen that such reflections precede the supposed alienation. It is not the reflection on the epoch in question which causes the existing ill-temper (as I have frequently convinced myself), but this peevishness is often the first thing that points to the menopause; it comes upon the woman in an entirely involuntary way, and she asks herself, her associates and the physician, what may be the cause of the change. This ill-temper also takes possession of those women who, for whatever reason, wish that the menopause was already passed, and have no reason to lament that it has finally begun.

I might take occasion in this connection to call attention to what, in my opinion, is a necessary modification of our view of the menopause. I hold that we should, above all, regard the climacteric changes as resting upon a broader basis than is generally received. Excluding things such as those last mentioned (influence of the patient's own reflections, etc.), it will be especially important not to refer too many of the climacteric phenomena to changes in the sexual organs, no matter how tempting this always is, for obvious reasons. The latter are also frequently the only evidence of the climacteric, and are nearly always the most striking one. It is certainly much more correct to suppose an extensive general change in the organism which simply results in sexual changes as well as every other single phenomenon.

To return to our real theme, I would call attention in connection with psychical alienation to another phenomenon, which is sometimes observed at the time of the menopause, *i.e.*, the occurrence of actual compulsory ideas. According to Krafft-Ebing[1] this "formal disturbance of ideas" is characterized by this peculiarity, "that some concrete, quite significant, and by no means ridiculous, idea remains fixed in the mind with an abnormal intensity and permanence, but so that the patient, in contrast to the insane delusion, is aware of the existence of the diseased condition, especially as regards the character of the idea." There is certainly a close relation between the disturbance in question and the sad thoughts already described. But while in the former case there is rather a general, vague feeling of ill-humor, in the latter the object is held more decidedly and tenaciously. We must remember, indeed, that in both instances we have to do with phenomena in individuals at the climacteric, and that in the second case we have also to do with a certain change in the disposition (inclination to melancholia). In patients with forced ideas there is, according to Krafft-Ebing,[2] a simple elementary disturbance of the unclouded consciousness, while in the mentally diseased woman (with melancholia) with forced ideas of a quite similar character are associated complicated functional disturbances, and a diseased and altered consciousness. In neither sense have we to do here with pure forced ideas The intellect is unimpaired, as has been said, and there is not yet an actual mental disease. We have to do also with a kind of transitional form of forced ideas; at least, I think that such observations as the following must be included under this head. Miss C., aged forty-seven, with a neurotic history, ceased to menstruate at forty-five. Now she is worried with a growing fear of apoplexy, which at first was confined to the times when she was attacked with dizziness, but is now constant. She is afraid to go out in public, and feels like falling when she is in the street. Mrs. G., aged fifty-six, was, during the climacteric, so troubled with the idea that she was going to lose her reason, that she consulted me repeatedly for this reason alone, and on each occasion she was in such despair that it was only after a long explanation that I succeeded in reassuring her. Mrs. K., aged forty-nine, has been irregular in her periods for four years, and during this time has been so distressed by fear of malignant disease of the abdomen, that it was necessary to consult a gynecologist. When I first saw her, she seemed to be really very ill, but the most careful examination revealed nothing. Every physician encounters occurrences of this kind. There is no doubt that the menopause with its different phenomena, some of which have been partly described and partly referred to, is an extremely active factor in producing certain constraining ideas. These are generally "not really irrational," since they are founded partly on actual anomalies of feeling (as the climacteric symptoms), and partly upon the correct observation of the actual misfortune that has occurred to others under similar circumstances. Fortunately these notions are not usually deeply-seated, they are quickly exchanged for others, and are often entirely absent for a long time. True forced ideas, like those above-mentioned, are much more rare. Individuals with an hereditary taint certainly form the majority of these cases. The following is a case in which the peculiar forced idea bore no direct relation to any particular climacteric phenomenon: Mrs. F. has completed her fortieth year. Her menses, hitherto quite regular, disappeared for a month. She was always extremely nervous, and suffered with severe headaches, but now feels better in this respect. Although she has no bladder trouble at present, on every occasion before she goes into company she is overcome with the fear that she may be obliged to pass her water, and will have no opportunity of doing so. Unless she is exactly acquainted with the situation, therefore, she no longer goes to any strange place. She attended a large concert, and although she had herself engaged a seat near the door of exit, she nevertheless gave it up because the door might possibly be blocked with people. Although, as I have said, the direct influence of a climacteric change is not evident in this instance, yet another forced idea, *i.e.*, fear of attracting notice, may have led to the development of the feeling described. The latter, however, might have its origin quite as well in some other noticeable climacteric phenomena (restlessness, change of color, etc.), and would not awaken our surprise, especially in the case of a woman who had always been thus irritable. A very frequent trouble with women at the time of the menopause is the occurrence of slighter or more severe attacks of dizziness. Throughout the opinions on this point there runs generally a certain view like a red thread. Just as on occasions this or that condition of the genitals is held responsible for a series of climacteric phenomena, so the dizziness, and many other symptoms, are regarded as an effect of the arrested blood-flow, in consequence of which all the vessels are immoderately congested (plethora). Now, it may certainly be true that sometimes hyperæmia lies at the bottom of the attacks of dizziness at the menopause, but this by no means explains all cases. Landois[1] defines vertigo as a disturbance of the common sensation of motion. This occurs if, by a perverse activity of those sensory nerves which convey sensations of motion, wrong impressions regarding the movements of the body or portions of it are transmitted to the central organ. These are the sensory nerves of the skin, muscles, joints, the ampullary branches of the acoustic nerve in the head, and the visual sense. Without entering into a detailed explanation, we can at once accept the one fact that in true vertigo, which alone we are discussing here, there is first of all a changed activity in definite nerve-tracts. Now the question arises how far this perverted nervous activity at the menopause is due to hyperæmia; the process itself might be regarded as due to vaso-motor influences exerted upon the labyrinth, analogous to the common explanation of other forms of vertigo. In my opinion this question is to be decided principally by the clinical observation of several individual cases. I have myself been long studying this point, and have made the following deductions: In an entirely healthy individual, who has hitherto menstruated regularly (as regards quality and quantity), the periods may disappear at once and forever, and nevertheless the woman may show no variation as regards consumption of food, digestion and general well-being (although the most favorable conditions for the occurrence of a relative plethora may exist); in her case attacks of vertigo may not necessarily appear.

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[1] Mitheilungen des Vereins der Aerzte in Styermark, 1883, p. 5.

[2] Loc. cit., p. 26.

In an individual who has already arrived at the climacteric without having experienced the slightest irregularity in the menstruation, or any change in the nutritive condition, violent attacks of vertigo may occur. The latter often appear while the menses are regular, even before the usual time for the menopause, and we shall seldom go amiss if we regard these as the first manifestations of the approaching climacteric. The menses may disappear so gradually at the climacteric, and the system may accommodate itself favorably to the cessation of the usual flow, yet severe attacks of vertigo may possibly occur.

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[1] Eulenburg, Real encyclopädie, XIV. p. 535.

The amount of blood lost at the time of the menopause may be disproportionately greater than before (not including the case in which actual anæmia developes), and yet there may be attacks of vertigo that are exactly similar. The periods may be absent for a long time (so that the system becomes accustomed to the cessation of the flow, and the manner of life may at the same time be quite rational, through the avoidance of sedentary habits, rich food, etc., and still vertigo may persist. Finally, as we would emphasize here, in consequence of severe climacteric hemorrhages, a profound anæmia may have developed, and a particularly nervous individual may, in consequence of disturbance of nutrition or other complications, be extremely reduced, and almost invariably under such circumstances she will complain of vertigo. I frequently see examples of the latter condition. But, from what has been said, it is sufficiently evident that the frequent appearance of attacks of vertigo at the menopause do not (at least in the majority of the cases) depend upon hyperæmia, due to cessation of the flow. It cannot be denied also, as I expressly affirm, that relative hyperæmia frequently occurs at the climacteric. Only, I hold that it is not true that this is not responsible for most of the cases of vertigo to be observed at this time. Now and then we are certainly obliged to suppose this mode of origin for the vertigo, as in cases in which there is dizziness when the periods are absent, and good health when they are present, relief of the vertigo after the reappearance of menstruation, or after scarification of the cervix, etc. If we assign hyperæmia as the only, or even the principal cause of vertigo at the menopause, we must do so if another cause can not be found. In my opinion there are various things which can give a satisfactory explanation of the phenomenon in question, and that we are to take the proper view of this question if we assume at the outset that the attacks of vertigo at this period of life may rest on an entirely different basis. Clinical observations agree with this opinion. Aside from the reported cases (which are certainly not very many) in which hyperæmia is the cause, I believe that simple hysteria first, then chronic disturbances of the alimentary canal, and finally anæmia, three conditions that complicate the menopause far more often than is commonly supposed, should be regarded as causal factors of vertigo. Hysteria is especially mentioned by Landois[1] in this connection, in addition to chronic affections of the respiratory organs, etc. In so-called gastric vertigo, according to Woakes, the abnormally irritated nerves of the stomach act upon the vaso-motor centre, especially the nerves of the labyrinth, in consequence of which variations in the tension of the fluid may be produced, and hence attacks of vertigo. Goltz explains the dizzy feelings by supposing that within the internal ear are the terminal ramifications of another nerve, having special functions, in that the auditory nerve can only receive sensations of sound. So much for true vertigo.

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[1] Loc. cit., p. 589.

Of similar character, but not to be confounded with true vertigo, are the conditions due to variations in the amount of blood in the cortex cerebri, "which are observed often enough in anæmic patients."[1] So far as I have observed, these vertiginous attacks, which depend upon cerebral anæmia during the climacteric, and for some time afterward, seem to play an important *rôle,* and are very often misunderstood. Certain profuse hemorrhages are soon forgotten by patient and physician, because they are "self-evident;" a persistent, fairly-satisfactory condition of nutrition, of a perfectly healthy appearance, leads them to think only of "plethora," and every fresh threatening of vertigo is now ascribed still more to the absence of the periods, while really it is due only to a persistent anæmia. We often hear indeed of "suppressed" menstruation, and the need of a diminution of the amount of blood urged in explanation of vertigo in certain individuals, who evidently have typical anæmia.

From a large series of observations on vertigo during the climacteric, I cite only a few examples. Miss C. dates her first attacks of dizziness from the time of her first irregular periods at forty-four; they increased in severity, and are now, at forty-seven, worse than ever. The attack is complicated by various hysterical manifestations. A certain feeling of anxiety frequently precedes them; then she feels as if ants were crawling from her finger-tips over the backs of her hands to her elbows, and from the tips of her toes over the extensor surfaces of her legs to her knees. Palpitation sometimes follows. The attacks themselves appear at no definite time; they begin by a buzzing or rumbling in the right ear, the patient thinks that she must fall and quickly supports herself. She usually has a feeling of weight in the stomach or slight nausea, and then the affair is over.

Mrs. H., aged fifty, has not menstruated for three years. One afternoon she was seized with a dizzy feeling, which lasted all night, and in the morning on rising it increased so much that the patient, without losing consciousness, sank to the floor. She could not leave her bed for several days thereafter, without feeling dizzy. For several weeks she had slight returns; sometimes there were frequent momentary attacks of congestion with general perspiration.

Mrs. G. C., aged sixty-seven, reached the menopause at fifty-three. The vertigo which she then had is now worse than ever. The patient herself naturally attributes it to her "full habit," but during the entire latter part of the time, she has had less appetite, sleeps poorly, and feels very nervous.

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[1] Landois, loc. cit., p. 541.

I need not cite any special examples of vertigo depending on actual anæmia. If we pay only moderate attention to this question, we shall find almost as many examples as those of loss of blood at the menopause. I only desire to emphasize in general the importance of this etiological factor. In the marked anæmia,—a direct consequence of profuse climacteric hemorrhages,—simultaneous attacks of vertigo are ascribed by everyone to the anæmia, just as other attacks after all profuse bleeding. Anæmia is only readily overlooked when this connection is somewhat obscure, and at the climacteric we are especially inclined to the one-sided idea of a "sufficient" or "excessive" amount of blood. That it is highly important to differentiate the attacks of vertigo at the climacteric, according to their different causes, is best seen when we consider the question of the *régime* to be adopted in any case. Without desiring to enter upon the question of therapeutics here, I can not avoid calling attention to the frequent uselessness of the precepts (which are generally quite artificial) with regard to women at the menopause. Considerable exercise, bland nourishment, the avoidance of liquors, and aperient mineral waters, should be prescribed; the occasional use of leeches may be useful in many cases, but in others they are positively contra-indicated. Individual peculiarities must unquestionably be carefully considered, and we must not allow ourselves to be influenced by certain prevalent ideas as to the necessity of dealing with this entire period in quite a summary manner.

I should like to add here a description of a peculiar phenomenon, which I have seen at the climacteric, sometimes slightly marked, and once quite plainly--the appearance of a sort of compulsory movement. It is well-known that this term has been applied to those characteristic disturbances of motion which are noted after the experimental injury of certain portions of the brain in animals, and which Henle refers to "dizzy feelings in the wounded animals." The injury, according to Landois,[1] causes in the animal in question, by irritating or paralyzing the apparatus that transmits sensations of locomotion, the delusion that the body or its environment is moving in a certain direction. The compulsory movements are executed involuntarily in consequence of this supposed motion, their purpose being to compensate for the abnormal fictitious movements by passive movements in a contrary direction. If now we observe a similar phenomenon in man (all injuries being excluded) it is most natural to infer that there is a cause of the direct "wound" corresponding to the injurious effect, and to make the external symptom, or disturbance of motion, identical with the above-mentioned forced movements. It can certainly not be clearly proved that the menopause, with its multiform disturbances of innervation (probably due to localized hyperæmia or anæmia), may give rise to conditions of irritation or paralysis of a nerve-centre, which, even if it only be transient (purely functional) in its action, may yet in its action closely simulate the cerebral lesions in question. The following is a case in which I found this phenomenon well marked: Mrs. G. is of a neurotic family, but has healthy sisters, and had herself no trouble of this nature until the beginning of the menopause. She married at twenty, and bore five children, the last at the age of thirty-one. After previous irregularities, the menopause appeared at fifty. The patient is now fifty-six. From the age of forty-three until fifty, the patient suffered from a complex variety of disturbances. Severe attacks of vertigo alternated with a sensation of extreme constriction of the breast, neck, etc.; vague anxious feelings, and for a long time a positive fear of becoming insane, crying out at night, frequent buzzing in the ears, etc., disturbed her to an unusual extent. What I wish to call particular attention to is this: while in bed, when her head was low and she was perfectly quiet, she felt quite well, but the slightest movement made her feel as if she was about to fall towards the right side; once she actually fell out of bed on the right side. On standing and walking, often everything went well, until suddenly the same feeling came over her and she was obliged to grasp at a support; if she could not reach it, she fell towards the right, even when the ground was smooth. Moreover, in walking it was impossible for her to move in a straight line, for, if not supported, after taking a few steps, she deviated somewhat to the right, in spite of the most determined resolution to the contrary. If she began to descend the stairs on the left side, after going down ten or twelve steps, she found herself on the right-hand wall. On the street she always preferred to hug the right-hand wall for support; if it chanced to be on the left-hand side, she invariably reached toward it, so as not to leave it. She passed on the right persons whom she met. This peculiar condition persisted at intervals until after her fiftieth year, when other vagaries appeared. Now she is quite well.

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[1] Loc. cit.

In my opinion the cause in this case was a certain anæmia, although the hemorrhages during those years often ceased for a long time, and the patient usually presented an entirely satisfactory appearance.

The remarks previously made on vertigo also apply to the congestion (flushing) and localized hot feelings ("flying heat") and perspirations which appear in pretty nearly every woman at the climacteric period. These too were formerly attributed to the cessation of the flow, but I can not insist too strongly upon the fact that all these phenomena very often occur when menstruation is still quite regular, and the patient's age is merely correspondingly advanced, that the menses may disappear with marked rapidity without their being very much increased (when the nutrition of the individual continues to be good), that they are often well marked when the periods cease very gradually, while they persist in case profuse intercurrent hemorrhages occur, and are rather increased than diminished by a certain degree of anæmia, and very frequently persist for many years after the menopause has taken place,[1] even to a time when a relative "excess" of the amount of blood in the individual in question must long before have been poured out. Although in isolated cases we may have to do with so-called "plethoric congestions" (actual increase in the number of red blood-corpuscles), yet we are most often compelled to include the climacteric "flushings" among the passive congestions, in which nervous influences cause a relaxation of the muscular coat of the arteries.[2] The various momentary sensations of heat, which are mostly the expression of an increased irritability of the nervous system, we must class with paresthesiæ (heat, formication, etc.) observed in the cutaneous region in hysterical patients. Finally, we must in most of the cases associate with the altered irritability of the nervous system (in which the sweat-centre in the medulla, as well as the nervous apparatus presiding over sweating participates) the outbreaks of perspiration at the climacteric; this is especially so, since Luchsinger and Adamkiewicz have shown that the blood-pressure plays in general no active part in the secretion of sweat, but that it depends upon the activity of true secretory fibres, partly cerebro-spinal and partly sympathetic. In short the outbreaks of sweating at this time are somewhat comparable to that increased secretion of perspiration which we encounter under other circumstances in excitable and nervous individuals, only that in the first instance the instantaneous outbreak is characteristic.

Reference should be again made to a condition, the significance of which, as was already said, is so often undervalued at the climacteric—anæmia. I believe that I hardly say too much when I affirm that the next most frequent cause of outbreaks of sweating is relative anæmia in individuals. With regard to the frequency of anæmic conditions at this time, I simply refer to what has been said before. An explanation of the occurrence of perspiration from anæmia is furnished by Luchsinger's statement, that certain changes in the amount of gas in the blood act upon the system of sweat-ganglia, "so that the marked tendency to sweating in anæmic subjects is to be ascribed in general to the diminution of the hæmoglobin and oxygen in their blood." The rapid appearance of perspiration in the individuals in question is a phenomenon peculiar to the climacteric, which possibly presents a sort of combination of the causal factors, anæmia and increased irritability. While at times certain regions of the body, corresponding to the size and number of the sweat-glands found at the places in question, appear as points of election for the sweating (the palms of the hands, soles of the feet, and axillæ), at the climacteric the site of the outbreak varies, still it seems that the individual variations of this character in a certain case are usually very constant. In rare cases the perspiration extends over the entire surface of the body; it is usually limited to the upper half. There are different places in which the sweating occurs with special frequency, as the breast, nape of the neck, hairy scalp, brows, etc. As was mentioned, the circumscribed region in question on which the sweat appears usually remains the same in the same individual. I saw a woman in whom the perspiration always appeared on the breast and back, another in whom it appeared only on the neck, and a third in whom it was confined to the breast, nape of the neck, and brows, as well as upon the flexor surface of the forearm, extending from the hand upwards. Mrs. D., who at forty-six had been irregular in her menses for some time, had outbreaks of sweating for two years over a region extending in succession from the abdomen to the breast and head, and then the perspiration appeared on the hands and bends of the knees. The condition always lasted till eight days before the next period. These outbreaks of sweating usually cease quite spontaneously. Merely a slight movement of the body, or especially a mental emotion of any kind, will increase their intensity and frequency; however, even repose at night usually makes no difference, and in some cases I was told that this was the worst time. In one patient, whom I remember, these outbreaks were even limited to the night time, without the patient presenting otherwise the least evidence suggestive of illness. Very often these attacks of sweating follow great fatigue and weariness, especially when they spread over the greater portion or entire surface of the body. As regards the duration of this condition, I have already remarked that it often begins a long time before the appearance of the first menstrual irregularities, and may persist for years after the establishment of the menopause. It is frequently noted that women are troubled in this way five or six years after the complete disappearance of menstruation; furthermore, I have often met with this phenomenon, and a short time before I referred to a Mrs. S., a widow aged sixty-seven, who had reached the menopause sixteen years before, but who nevertheless about once in one or two weeks was suddenly seized with sweating, which affected the upper part of her body, especially her face. This condition was always increased whenever she felt slightly indisposed.

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[1] Often even in much greater intensity during the later than during the earlier years after the menopause.

[2] Probably dependent upon a change in the vaso-motor centres, due to reflex impulses transmitted thither by numerous other nerves.

The conditions referred to here as flushing, or localized sensation of heat, and the general or localized sweating, usually appear together. They very often affect simultaneously the same portion of the body. But this is by no means always the case; on the contrary, I have frequently found that one or the other of these phenomena was entirely absent when the others were present. This is especially marked during the "post-climacteric period," and it may, I think, furnish a useful hint as to how many a peculiar complaint at this time is to be regarded from the physician's standpoint. If one or the other of these phenomena disappears (even after it has been present), the remaining one is, just because it has been separated from its usual association, no longer regarded according to its character as a simply climacteric phenomenon, although it really is so. Hence frequently arise errors which could easily be avoided by a more careful examination of the natural processes.

As regards the hemicrania, which shows such a predilection for the female sex, it is in general true that this important expression of the neuropathic family trait appears by preference at the time of the woman's sexual activity. Appearing less often in childhood, this affection usually begins with puberty, persists throughout the period of sexual maturity to a greater or less degree, and disappears after the individual has entered upon the menopause. There is no doubt that we can, as a rule, reckon pretty certainly upon the cessation, or at least an essential improvement, even in the most severe attacks, at the time of the climacteric. I have seen this proved in many cases; in some of these, which were quite severe, a decided improvement began even before the first menstrual irregularities, as I would like to illustrate. On the other hand, there may be an aggravation of this condition while these irregularities continue, as well as after the establishment of the menopause. Mrs. B., aged forty-eight, from a nervous family, has been irregular for nine months. For twelve years she has had migraine just before her periods, which has increased greatly during the past two years, until now she is obliged to avoid any exposure to cold air.

Miss L., aged forty-three, had migraine before every period. For some months she has had symptoms of the approach of the menopause, and the headache now appears every two or three days, instead of only once a month as before. Mrs. G., aged fifty-six, ceased to menstruate at fifty. Now she has migraine every week instead of at longer intervals.

In the realm of the higher sense-organs, we frequently encounter during the menopause certain hyperæsthesiæ, paræsthesiæ, idiosyncrasies, also anæsthesiæ, which are simply comparable to the same conditions in ordinary hysteria. As the chlorotic disposition —that is, a hypoplastic condition of the blood—if we look for it, is not absent in the marked cases of hysteria, "even when the patient complains of plethora, palpitation, pulsation in the abdomen, and fullness of the head and breast" (Rudolf

Arndt), so, in my own, we shall not go amiss if we connect those functional disturbances at the climacteric also with defective nutrition of the nervous system. The nervous system may at other times indeed be improperly nourished, just as here and there in hysteria every chlorotic or anæmic cause can be excluded. Excessive sensitiveness towards a bright light, increase in the intensity of sound-impressions, or odors of every form, is a phenomenon frequently noted, and it may persist for years after the menopause. One of my patients began, about six months after the last appearance of her periods, to be so irritable that she was always seized with nausea if a light was suddenly brought into the room in the evening, or any one addressed her in a loud tone. I met with very peculiar instances of abnormality in the sense of smell in the following cases:

Mrs. A., since the time when her menses began to be irregular, has not been free from the idea that a number of objects smelt like strong fat, or like "brass, that had been cleaned with vinegar;" this cigar seemed to her to be "burnt," that soup to be "rancid," the smell of the coffee reminded her of dish-water, etc. Mrs. N., ever since she began to be irregular, experiences with the return of each flow a peculiar odor of burning ("like burning fat"), which continues for four or five days, is most marked in the evening, and only disappears on using petroleum, after the removal of which it at once returns; it is also to be noted that this was an odor to which the patient was previously so accustomed that she described it as formerly agreeable to her.

Mrs. G., who reached the menopause seven years ago, is likewise troubled with the sensation that everything smells of "strong fat," etc. In the two former women there were well-marked symptoms of anæmia.

There is very often a vague complaint about a bad taste, although of no pronounced type. The variable character of this phenomenon is characteristic. Ringing in the ears, a low humming or loud buzzing in the ears, appears temporarily in nearly every case, but it may now and then become extremely painful by reason of both its permanence and its intensity. Transient hardness of hearing is often associated with it. Allusion should also be made to the dimness of vision. which so very often occasions uneasiness at this time.

Among the neuralgiæ of the skin and contiguous parts, frontal and occipital pain especially often appear during the menopause, also mastodynia, intercostal lumbago, neuralgia and sciatica; myalgia of the neck, back (some forms of lumbago) and limbs, and pains in the vertebral column and sacrum also occur. Thus it happens that, in the same patients who are affected at one time with certain paræsthesiæ, and at another with slighter or more marked forms of hyperkinesis (among those in the internal organs are to be mentioned spasm of the glottis, nervous asthma, and cramps of the pharynx and œsophagus, such as give rise to globus), the most peculiar conditions naturally develop, which, although they are in themselves always rather harmless, nevertheless are regarded by the patient herself as well as by her friends, as evidence of a very severe course of the menopause. I cite here a couple of examples of the multiform complications which are observed under these circumstances. Mrs. D., aged forty-six, childless, has been irregular for three years. During the past year she has violent pains in the back at night, extending down the thighs, so that she can not sleep. These disappear eight days before each period, to reappear about eight days after. She has also been troubled for years with a burning, pricking sensation in the neck, especially in the evening, to which is added a week before her period feelings of constriction as well as a constant inclination to swallow.

Mrs. H., aged forty-eight, has been irregular for a year. Beside headache, vertigo, etc., she was at first troubled with violent itching between the shoulders, which has recently changed to a fixed burning pain in the same locality. The adjacent vertebræ are painful on pressure. This pain is most severe when she is in a sitting posture. With it is constantly associated a feeling of oppression in the chest and dyspnœa, so that the patient thinks every moment that she is going to be suffocated. At the acme of this attack she always becomes as pale as a corpse. On rubbing this spot in the back, some relief is obtained.

Mrs. R., aged forty-four, a strong, healthy working woman, married at eighteen, and was pregnant sixteen times. During the past six months she has been irregular, and has had flushing vertigo, etc., together with the following symptoms: Every noon (sometimes afternoons), she has a violent burning feeling on the ulnar side of the forearm, just as if a hot iron had been drawn along it. This disappears after some minutes, but always returns. At night she has a feeling of stiffness in the knee and calf of the leg, so that every movement is painful. If she is very tired this stiffness may last several days. At the same time there is a pricking feeling in the legs, as if from the insertion of needles.

A good many of the pains in the back and loins at the time of the climacteric are due to excessive distension of the belly-walls through the accumulation of fat. On the other hand, we may meet with cases at this time in which the backache forms the only subject of complaint, although no demonstrable cause is present, and the individual has had previously no nervous or hysterical symptoms whatever. The following case is typical in this respect: Mrs. K., aged fifty-three, the mother of three children, began to be irregular at forty-nine, and ceased to menstruate at fifty-one, when she began to have slight backache, which has constantly increased during the past two years. These "drawing" pains appear, whatever posture she may assume, but are increased by the warmth of the bed, so that she cannot sleep. The sacrum is sensitive on pressure, but nothing abnormal can be found.

A phenomenon associated with the visceral hyperæsthesiæ which occur at the menopause, is a feeling of palpitation and pulsation of the arteries, especially those of the abdomen; neuralgic affections of the heart now and then accompany them, such as transient stabbing pain, sensations of tearing, etc., or spasm of the heart, which, consisting mostly of parakinesiæ, "combine with paræsthesiæ and constitute the conjoined symptoms (symptomen complex) of angina pectoris in all its possible grades and variations" (R. Arndt, on "Hysteria"). Very often there is a sudden increase in the frequency of the pulse, and sometimes the women are constantly troubled with palpitation of the heart. If these various complicating functional disturbances are extremely violent, we may be inclined to suspect a form of heart-disease peculiar to the climacteric, described by E. Clément as "cardiopathie de la menopause."[1] Although the conclusion arrived at by that author may be rather too sweeping, some of his observations have been confirmed on many sides, *i.e.*, the beginning of palpitations while the menstruation is still regular or at the time of the first irregularities, their successive increase until they amount to regular attacks associated with vertigo, precordial pain and dyspnœa, their onset during violent movements or in sleep, and, finally, a tendency to attacks of fainting, etc.; at the same time there is an irregular, small pulse, but no organic heart-lesion, no catarrh of the lungs, no albumin in the urine, only there is always striking paleness and frequently advanced anæmia. To explain this affection, Clément supposes that there is a special predisposition, produced by the menopause, to marked change in the innervation of the sympathetic, and he affirms that the attacks described are due to reflex impulses from the sexual organs, which, through irritation of the cardiac accelerator nerves, cause spasm of the vessels. Without entering any further into this subject, I would merely take occasion to refer again to the accompanying anæmia, to the presence of which in all his cases Clément calls special attention. I believe that it is hardly possible to lay too much stress on this factor in connection with most of the disturbances of innervation at the time of the climacteric.

I sketch briefly some striking cases that have come under my own observation. Mrs. K., aged forty-nine, has always menstruated regularly. During the past year she has had attacks of palpitation, beginning two or three days before her periods. These are repeated several times a day, and have increased to such an extent that the patient is now obliged to remain in bed during the whole period, on account of the constantly recurring attacks of syncope.

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[1] Lyon méd. Aug., 1884.

Mrs. B., aged forty-nine, has of late menstruated more profusely than before, and during the past two years she has suffered with depression, nervous irritability, vertigo, etc. She has always had a slight palpitation, but no organic trouble was ever found. During the last few months the palpitation has become unbearable; she has dyspnæa, and can not take a step because of the increased cardiac disturbance thus produced.

Mrs. L., aged forty-five, has during the past six months menstruated regularly, but more profusely than normal. During this time she has had vertigo, headache, etc., and violent palpitation, especially at night, increased by the slight nervous excitement. She looks perfectly well and feels better at the time of menstruation. Such a case would be regarded by the hasty diagnostician as one of plethora, and a "reducing" *régime* would be advised. On more careful examination, we shall often find that the reverse is the case, just as here where the woman in question said that her red cheeks were at other times quite colorless, that her present state of nutrition was less than formerly, and that all her troubles, especially the distressing cardiac palpitation, were always worse just after her period, that is, after the actual loss of blood. The best evidence for the anæmic condition, which was at the bottom of the trouble, was furnished by the mucous membranes, which were strikingly pale, even at the times when the woman was looking at her best.

I wish to refer here to another circumstance. Potain, in his "Diagnosis and Treatment of Chlorosis," describes three forms of the latter, a temporary one which is more or less connected with the period of development, a second characterized by frequent recurrences, and a third which affects individuals previously very delicate, lasts during life, and although apparently cured, returns with the menopause. If the climacteric really exerts this unfavorable influence upon certain forms of chlorosis, the knowledge of this fact seems to me to be of importance in deciding upon many cases. Hence we arrive at the simple conclusion, that in cases of long-standing chlorosis the climacteric is generally regarded with distrust, and that again, when the menopause appears with unfavorable phenomena, in cases in which there has previously been obstinate chlorosis, there arises at once a suspicion that this trouble may be increased, and in this is sought the nearest explanation for the phenomena in question. I believe that I can prove the actual existence of the supposed evil influence of the climacteric upon chlorosis of long-standing by the following case, which at the same time furnishes another example of the phenomenon of palpitation of the heart before-mentioned. Mrs. R., aged forty-nine, the mother of five children, has for a year had vertigo, sweating and "congestions." Her periods are now quite irregular, and were absent during the last two months. The integument and mucous membranes are extremely pale. Her principal complaint now is of heaviness in the legs and unbearable palpitation, both of which conditions have increased to an unwonted degree during the past year. The heart-sounds are clear, the pulse 120 when the patient is in repose. No abnormality can be found in the chest. Since the patient has lost no blood to speak of for a long time, and all other causes can be excluded, we must suppose that this is an aggravation of her old chlorosis, due to the beginning menopause. This patient's vertigo, etc., were relieved by a short course of iron, and her pulse soon sank to 96 beats.

If we turn now to the gastro-intestinal symptoms, we find that catarrhal conditions are most frequent during the climacteric. Busch is quite right in affirming "if digestive troubles were present before, they are increased at this time." Former catarrh of the stomach reappears, or becomes worse, and not infrequently catarrhal affections begin then. Now and then an improvement, or a complete cure of long-standing troubles of this nature, is noted. It is well known that there are obstructive congestions due to general plethora, which we are much inclined to regard as the cause of the conditions in question. From what has been mentioned in these lines, it is evident that in a large number of cases this view must be limited. Latent anæmia is often at the bottom of it, and still more frequently perhaps it is merely a question of disturbance of innervation. The frequent occurrence of nervous dyspepsia at the climacteric proves how important a *rôle* may be played by the latter. It is highly interesting to consider other nervous phenomena of gastric origin which may be produced by the menopause. I have often encountered the unique paræsthesia of certain of the gastric nerves, known as heart-burn. It was best marked in a Mrs. S., who since her thirtieth year had suffered with severe menorrhagia, and at the beginning of her fortieth year had become very anæmic. In her forty-fifth year the hemorrhages ceased for three months, and, although she had a good appetite and no other dyspeptic symptom, she had severe heart-burn, which had no connection with eating and appeared during the day and night, lasting for two hours. This symptom lasted for five weeks and disappeared when the menses recurred, but reappeared in a less severe form during the subsequent inter-menstrual periods. What I would call particular attention to in this case is the appearance of a single symptom which we are accustomed to observe as one of a number of symptoms. In my opinion peculiar characteristic pictures are thus presented which are no more obscured by others which we meet with. Take only the most familiar affection, nervous dyspepsia. With Leube we understand that it is an abnormal irritability of the nerves of the stomach, which arose spontaneously or in connection with a general neurosis (or chronic intoxication), and is recognized especially by dry retching and feelings of pressure in the region of the stomach, disturbance of appetite and heart-burn, headache, disturbed sleep, and weariness. Although one or another of the symptoms mentioned may be most prominent, it is the more or less marked combination of these conditions which constitutes the affection in question. The presence of a single one of these symptoms (although it may seem to have been directly withdrawn from this chain) does not justify us in diagnosticating this affection, still less one remotely allied to it; we are rather compelled to allow to the symptom in question a certain independence, and under some circumstances we may even speak of what we were otherwise accustomed to consider only as a symptom, as an affection in itself. This is often the case at the menopause.

Just as in the case before-mentioned, heart-burn was the only symptom, so I have observed eructation, which was most marked in Mrs. D., in whom there seemed to be a certain element of heredity, since her father and sister were said to have suffered greatly from "wind-colic." Since the birth of her last child, eighteen years before, she has had a sharp pain in the stomach on taking solid food, relieved by the passage of wind by the mouth and anus. She reached the menopause at forty-seven, and from this time until she was fifty-three the trouble increased so much that she was confined to her bed for a long time. When I saw her she seemed to be healthy, but was obliged to sit upright in bed for half of the night in order to empty her stomach of gas. Her appetite and nutrition were good. The eructation could be induced artificially by stroking any part of the woman's body (except the front of the neck and the buttocks) with the fingers. Rudolfi reports a similar case.

I might in this case suppose that there was some more comprehensive disturbance in the alimentary tract (either catarrhal or peculiarly neurotic), or I might explain it as a case of simple hysteria, as in an analogous case of Peter Frank's, but in this instance the isolated occurrence of the symptom described (no other hysterical complications being present) was always striking. Vomiting is a symptom peculiar to the menopause, occurring either alone, or in connection with well-known climacteric phenomena. If there is at the same time increased secretory activity in other directions (hyperhidrosis, etc.), it is quite natural to regard the condition in the stomach as a hyperekrisia. The increased production of probable abnormal gastric juice, accompanied by further change in the innervation of the stomach (hyperæsthesia hyperkinesia) is regarded as a sufficient cause of the often excessive vomiting (Arndt's explanation of hysterical vomiting), although there is in this particular case no reason to suppose that there is a direct irritation of the vomiting-centre. However, the latter is sometimes probable, and then we have a peculiar picture displayed, which we can refer to a combination of the conditions mentioned. Mrs. H., aged forty-four, ceased to menstruate six months ago. For two years she has had marked anæmia, attacks of vertigo, sweating, and finally vomiting. She has towards morning, after she has had a good sleep, a general sensation of heat, restlessness, sweating and vertigo, and finally vomiting; she may vomit twenty times in between one and three hours. The patient then has a cold feeling over her body, but again falls asleep. The next forenoon she is very tired and is troubled by frequent retching; in the afternoon she feels perfectly well, especially if she has previously taken a nap. At first food is vomited, then mucus or bile, but never blood. When the attacks first began they recurred twice in a month, or more often twice a week; now they are often absent for months, and come on only at night. There is no clear connection between the attacks and the cessation of menstruation. The appetite is good, there is no nausea or any pain in the stomach; the patient has increased in adipose during the past year.

A question which, I think, ought not to be omitted here is whether the menopause has any influence upon the development of round ulcer of the stomach, or not. Tilt,[1] under the head of diseases, reports four cases of hæmatemesis among 500 women during the menopause. Krieger observes that there is no proof that there is any connection between the trouble in question, and the cessation of menstruation, "hæmatemesis, dependent on a round ulcer of the stomach, appears also in young persons, so that it is not evident why these four cases should have been caused by cessation of the menses." The matter cannot be dismissed so briefly. The fact that ulcer of the stomach may appear in women at other times also, and also in men, would not exclude the possibility of the climacteric playing a part among the predisposing causes. Only results of many observations can clear up this point. Let us study the question itself a little more carefully, and I ask permission to add something to the necessary material by communicating some observations made by myself. There are two points in our subject which are most prominent—first, whether from the observations on the average time of appearance of gastric ulcer, it has any connection with the climacteric; secondly, whether the long recognized conditions under which the disease in question developes, may now and then be again presented by the natural changes at the menopause. The substantiation of the latter point would justify us in speaking in connection with the cases observed at this point of a condition that is associated with the menopause. With reference to the first point, I find some information, but only a little. Rokitansky[2] observed the affection especially in the prime of life, "but often very early in the female, even in the fifteenth year." From this fact alone we can scarcely arrive at a conclusion, but it seems to me that this statement is important in connection with the following: Jaksch,[1] who, with others, has distinguished himself by his statistics on the frequency of round ulcer of the stomach, found that it occurs at every age, but in mature years more frequently than in childhood, and that women are affected more frequently than men. Moreover, Niemeyer affirms (though with some reservation) that disturbances of menstruation are among the primary causes. Its frequent occurrence in females is certainly established. It is probable that the prime cause of this lies in the sexual life of women. It seems possible (compare Rokitansky above) that puberty may cause a certain predisposition to the development of the disease. The idea that this possible predisposition at the time of puberty may recur at the climacteric, a relation which we have encountered quite frequently under other conditions, is at least not disproved by what has been mentioned.

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[1] "Change of Life," p. 161.

[2] Handbuch der path. Anat., III., p. 193.

As regards the second point, we have hitherto only been able to reach a certain limit in our knowledge concerning the mode of development of the ulcer. Oser[2] states clearly the present status of the question, *viz.:* Ulcer of the stomach is due to auto-digestion of the stomach at certain circumscribed spots. This auto-digestion is rendered possible by circulatory disturbances in the gastric mucous membrane. Why this process takes place, and why the ulcer heals in some cases, and not in others, is at present unknown. If we avoid entirely the present controversy over Pavy's view (that the acid gastric juice is neutralized by the alkaline blood circulating through the tissue, etc.), it is only the factor of circulatory disturbances, hitherto regarded as necessary, which we must keep in view. The manner in which these circulatory disturbances occur is differently explained by different writers (Virchow, Cohnheim, Klebs, Rindfleisch, Axel Key). Without doubt there are disturbances of different kinds, which may produce the effect in question. It is important, as far as we are concerned, that the supposed circulatory disturbances should, in part at least, run parallel with those which, as we know, may be produced by the climacteric. If this is the case, then the idea that there is an increased tendency at this period to the formation of the ulcer in question is to a certain extent justified. If now Klebs finds that the probable cause of the disturbed circulation is a spastic contraction of single vessels, or Axel Key that it is due to frequent attacks of cardialgia, which, by contraction of the muscularis, cause interruption of the venous circulation, then we must allow that, considering the numerous vaso-motor disturbances as well as the various attacks of cramp (especially in the gastro-intestinal tract) observed during the climacteric, the connection of corresponding causes with a similar result, belongs especially to the menopause. The fact that gastric catarrh is particularly frequent at this time, lends support to the idea that there is an increased tendency to the formation of ulcer. According to Virchow[1] "acute and chronic catarrhs, especially such as are attended with violent vomiting or with severe cramp-like contractions of the stomach, * * * even without obstruction of the vena portæ or blood-stasis, cause hyperæmia of the mucous membrane, hemorrhagic erosions and bleeding ulcers." Without pursuing this subject any farther, it seems to me to follow already from what has been said that it is certainly not opposed to the theoretical view to consider that there is a possible connection between certain gastric ulcers, and the climacteric changes in the body. Of course we must wait for the confirmation of this view until numerous observations have been made with regard to this point. I, for my part, on the strength of the three following observations, am very much inclined to regard the theory in question as a correct one.

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[1] Vergl. Pathologie u. Ther. Niemeyer's, I., p. 477.

[2] Eulenburg, VIII., p., 487, *et seq.*

Miss K., aged fifty-four, was always healthy. She began to menstruate at fifteen, and was regular until towards the end of her fortieth year. At forty-seven she began to suffer with gastric catarrh, while her menstruation was still regular. At the end of her fifty-first year, she began to be irregular, and the gastric symptoms became more marked, severe pain in the epigastrium being complained of, while she vomited fresh or changed blood. She improved each time that the menstrual flow recurred until her fifty-second year, when the gastric trouble increased during a period of seven months, and was again relieved by the reappearance of the menses. The pain and vomiting then began to be so severe that it was necessary to nourish the patient by rectal enemata. After the lapse of a month she recovered, and although six months have passed since her last menstruation, she is now well in every respect. I would observe that this very intelligent lady carried out the physician's directions most strictly throughout the entire period mentioned, a fact which must be kept clearly in view in deciding concerning the often brief exacerbations of the trouble. I could find no cause for the prolongation of the genital hemorrhages in this case; a most careful examination of the pelvic organs showed that they were normal. Faintly-marked climacteric phenomena increased during the last two years, but showed no peculiarities.

The phenomena in the following cases were somewhat more marked, and in this instance there was a single attack and the patient had no recurrence. Mrs. K., aged fifty, matured at sixteen, and ceased to menstruate at forty-four without suffering any evil consequences. She had had gastric catarrh at different times, the attacks lasting three or four months. At forty-six she suddenly lost her appetite, was feverish, had pain in the stomach and back, then nausea and hæmatemesis, the latter continuing three or four times daily for an entire month. The ingestion of every kind of nourishment, except small quantities of milk, caused her at once the most violent pains, so that hæmatemesis sometimes followed the swallowing of a few crumbs of bread. The entire duration of the malady was four months; since then there has been no recurrence. I may also mention as being quite characteristic, that in this case the culmination of the peculiar nervous phenomena is just to be observed now (in her fiftieth year), although the menopause occurred at forty-four. She has lately had sleeplessness, palpitation, and nervous vomiting (caused merely by psychical disturbance), while the slightest mental excitation causes a peculiar trembling and shivering of the woman's whole body.

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[1] Archiv. f. path. Anatomie, V., p. 363.

Finally, I shall refer briefly to the third case, Mrs. H., who was always healthy, and between the ages of forty-five and fifty was irregular in her menstruation. At fifty-one she became very ill, presenting symptoms of gastric ulcer; they continued for about six weeks, and within three months she had recovered perfectly, and has had no return. It is self-evident that no conclusions can be drawn from such a small number of cases. However, if the view is proved that there is an actual connection between the condition in question and climacteric changes, then it seems from the observations mentioned, as if in cases in which gastric ulcers develop after the final cessation of the menses, the inclination to recurrence is less; and that the affection is distinguished by its persistency and long duration, in cases in which (as in the first instance) its inception coincides with the first irregularities in menstruation. As regards the development of the condition, Cases I. and III. (not Case II., in which the patient was a weak and previously rather an anæmic woman) are valuable in connection with the generally-adopted theory of obstruction to the circulation and "fluxions at the menopause."[1] In both cases there had been previously no profuse loss of blood, and in Case I., as was mentioned, there was fresh improvement with each recurring period. But it remains a striking fact at least that in Case I. the increased genital hemorrhage which subsequently occurred had no influence on the condition, and that in Case III. the symptoms began just a year after the cessation of the menstrual flow. At all events, it would seem to me, adhering to our hypothesis, that the question is worth considering, whether in these cases simple disturbances of innervation (analogous to most of the climacteric abnormalities) are not at the root of the phenomena, and produce secondarily those localized circulatory disturbances to which we referred above as the supposed cause of the ulceration in question.

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[1] Regarding a general obstructive hyperæmia of the entire mucous membrane of the stomach as the primary cause of the trouble in my cases.

As regards the intestine in particular, we observe that women during the climacteric years very often suffer from chronic meteorism. Whether this is partly referable to abnormal collections of air, or especially to simultaneous digestive disturbances, which, as has been said, are very common at this time of life, the principal cause of the phenomenon in question is a relaxation of the muscular coat of the intestine, in consequence of which the gut is unable to force its contents forward. Without doubt this condition is due to a change in the innervation and not to any permanent organic change, for sooner or later improvement almost invariably occurs. From a diagnostic standpoint it is of course important to bear in mind at all times the frequency of this condition, as well as of an accumulation of fat in the abdominal wall, during the climacteric. It happens quite often that on account of the excessive size of the abdomen some serious affection is supposed to exist, where none whatever is present. An exact diagnosis of the condition of the abdomen is certainly very often rendered difficult by the existence of both of these two states. In connection with the distension referred to, I cite only a single case, which seems to me to be quite instructive. Mrs. N., of M., age fifty-three, the mother of four children (she ceased to menstruate two years ago), gives at the first glance decidedly the impression of a person who is seriously ill. She is poorly nourished, of a yellow hue, extremely nervous, and has a very large abdomen. It is at once supposed that a serious abdominal trouble is present, and it actually happens that the patient is considered as having a diseased liver and spleen, etc. On the contrary, an examination shows that this is only a case of excessive meteorism, the organs being all normal. The simultaneous extreme distension of the stomach was to be referred to a pre-existing chronic catarrh, whence also the depraved nutrition. The distension of the abdomen seems to have begun at the time of the menopause. The combined nervous troubles also recall well-known pictures of the climacteric. The yellow hue must have existed before.

The relaxed condition of the intestine leads on the other hand to chronic constipation, one of the most frequent conditions at the menopause, which is generally absent in cases in which the intestinal activity was previously perfectly regulated. Less frequently (in this the observations in this direction generally agree) persistent diarrhœa is present. However, I should not hesitate to regard the latter in certain cases as a rare climacteric phenomenon, that is, as a condition due to the climacteric changes; these attacks are sometimes so very characteristic in their duration, course, and recurrence, and are in their entire extent connected in such a striking manner with the climacteric period.[1] A point in connection with intestinal activity which I would not omit is the following: I have several times observed that where the intestines have previously been sluggish and ill-regulated, with the beginning of the menopause an entire change occurs, so that from this time forward for years their function is perfect. At other times when there were frequent attacks of diarrhœa, these increased at the climacteric, or, on the other hand, ceased more or less entirely, or even gave place to a persistent tendency to constipation. Still again, where the intestinal activity was previously normal, now it becomes in some way irregular, usually (as was remarked above) by a change to obstinate constipation And finally, in a few cases where the intestinal activity was normal before, as well as during, the climacteric, there was, however, here in every instance a marked change noticed from the commencement of the menopause, somewhat easier or more difficult, somewhat more frequent and less copious evacuations, etc. Although, as before said, it is most common to have more or less of a tendency to constipation, as is particularly noted during the menopause, I believe that I can assert with considerable positiveness that in all the other cases also, in which this phenomenon does not occur, there is some change to be noted in the intestinal activity, which is to a certain extent opposed to the previous condition in the given case.

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[1] Recalling certain types of menstruation to be observed at this time.

We observe very peculiar variations with regard to sexual desire during the climacteric period. Not seldom the sexual passion disappears more or less completely from this time; more frequently it persists throughout the entire menopause, or finally it very often increases in intensity at this time, and may become positively distressing. We may, perhaps, consider the first-mentioned phenomenon as really the normal condition, agreeing as it does, with the cessation of the sexual functions in general. In fact, I have also often been able to show that increased sexual desire at the menopause was due to some abnormal condition of the genitals, as fibromata, flexions, etc. However that may be the increase of the passion in question, as long as it does not exceed a certain measure, is to be regarded as one of the symptoms of the visceral hyperæsthesiæ which develop at this period. In the excessive forms, which may sometimes be associated even with general convulsions, we shall in every case at once recognize, with Romberg, a neuralgic condition of the spermatic plexus. Patients during the critical years complain especially of the presence of this condition before the beginning of an actual or expected period, which has frequently begun just at the commencement of the first irregularities.

How long this disturbance may continue after the actual menopause, I saw in the case of a Mrs. G., who, after a childless marriage, began to be irregular in her menstruation at fifty, and reached the menopause at fifty-four. From about the fiftieth year are dated the initial symptoms of an abdominal tumor (pressure on the bladder, bearing-down feeling, pain on movement, etc.), which I am now, in the patient's fifty-fifth year, able to recognize as an interstitial uterine fibroid, the uterus corresponding in size to that of the gravid organ at the fourth month. While in this case some of the other climacteric phenomena began to disappear between the fifty-sixth and seventh years, the sexual passion (and another symptom associated with it, *i.e.*, nervous cardiac palpitation) reached its height towards the sixtieth year. As long as the menses continued to reappear after the beginning of the irregularities, the patient experienced no essential difference in regard to the degree of her sexual excitability. The latter persisted as before, and at the most, somewhat increased irritability was noticed before the end of some periods, which was diminished after these had ceased. Since her menses stopped entirely, however, she has had regular paroxysms of sexual excitement, so that at night she would be unable to sleep, or would be distressed by erotic dreams. This condition increased until she reached her sixtieth year, when she began to improve.

The following much more aggravated case may also be cited here, since it shows the influence of the climacteric: L., aged forty-four, widow, of a neurotic family, has suffered for twelve years with strong sexual desire on the slightest irritation. At the time of puberty, whenever she had the slightest relation with a man, she was affected with vertigo, headache and sleeplessness. At twenty-one the least sexual excitement was always followed by vertigo, clonic spasms, and syncope lasting for an hour or two. At the beginning of her thirtieth year the attacks assumed more of a tonic character, and at thirty-five the slightest sexual excitement caused such an attack, attended by complete loss of consciousness. At forty-four her menstruation became more profuse, and her sexual irritability increased. The spasms became less marked, and the patient now began to indulge in fancies, until she reached a condition of complete unconsciousness, from which she awoke as from a profound, unrestful slumber, weary and depressed, with head and backache, so that she could do no work for hours. Moreover, since the beginning of the climacteric, things which stand in no direct relation to sexual processes also act as irritants, producing the same effect, such as domestic occupation, the least mental exertion, etc., and now the whole trouble is of a mental character, while the patient occasionally has suicidal impulses. There is here at least a transition to an actual psychical disturbance. We must not overlook the fact that in consequence of the increased sexual desire at the climacteric, there is very often a sufficient excuse for satisfying it in an unnatural way. Thus arise a series of physical, and especially psychical, abnormalities, on account of which the physician is sooner or later consulted. In this connection I have often observed a deep dejection, bordering on despair, which at first is always attended with certain rational reflections (such as the antagonism between their own action and certain firmly implanted early precepts), which is twice as glaring, considering their advanced age; or, they may think of the possible injury to their health, etc., but which expresses itself in an indefinite stupor, which on the one hand makes them heedless of advice, and on the other leads to the loss of all will-power, such as might prevent the further continuance of the causal condition. There is no doubt that just here is to be sought a cause of psychoses, which in many cases can not be under-estimated.

A frequent affection of an extremely painful character, which is most common in women at the menopause, is itching of the genitals. The itching is usually confined to the external genitals, or extends upward to the vagina, as well as over the perineum to the crural folds. Sometimes a local condition can be found to account for it. Catarrh of the vagina or cervix, displacements, inflammation, morbid growths within the uterus, abnormalities of the ovaries, bladder and urethra, may now and then be properly held responsible for this trouble. Cohnstein[1] calls attention to a condition of circular hyperplasia of the portio vaginalis, "which, on account of the ectasiæ of the vessels, bears the closest resemblance to hemorrhoids," (in fact Virchow has observed it sometimes alone, and sometimes associated with hemorrhoids,) the most annoying symptom of which is pruritus. That the latter is only a reflex irritation, due to the "hemorrhoidal hyperplasia" of the portio, Cohnstein thinks is confirmed by the fact that external applications give only temporary relief, while the evacuation of blood from the cervix cures the itching at once. Aside from all these forms, we occasionally meet with cases of severe pruritus during the climacteric, in which we seek with the greatest zeal for some cause which is accessible to local treatment, but in vain. As in the case of other climacteric phenomena, such an external cause is often entirely wanting, there being only an idiopathic neurosis (if I may so term it), like those of which we have seen so many examples of other sorts at this epoch.

The patient often complains of itching confined to the anus. Ectasiæ of the hemorrhoidal veins are usually found in such cases, while at other times all the relations are perfectly normal. Although the condition often defies all treatment, it usually disappears quickly after existing for a shorter or longer period.

Among the trophic changes certain hypertrophies generally appear during the climacteric period. A general deposit of fat occurs, or there is frequently an increased amount of adipose in the abdominal wall and the breasts, while here and there coarse hair appears, with a fresh deposition of pigment, etc. As is known, the increase in adipose has been connected with the retention of blood within the body, which is now diverted to a different use, or, on the other hand, the chief cause of the fat-formation is found in the cessation of ovarian activity, as proved by the greater ease with which female animals are fattened after extirpation of the ovaries. The former idea at once appears doubtful if we only recall the numerous cases in which a marked increase of adipose has taken place before the periods ceased, and when the regular monthly flow was even increased, or where there were occasional climacteric hemorrhages, which were so profuse as to render the patient actually anæmic. The second view, that the increase of fat is due to the cessation of ovarian activity, seems to be much more plausible. Aside from the experience in the case of animals, to which reference was made, this is supported by other observations: castration in the human female is frequently followed by an increased development of fat, while younger women, in whom there is a tendency to the accumulation of adipose, often conceive no longer, etc. But, there are some weighty arguments opposed to this view also. If the increase in fat at the climacteric is a result of the cessation of the ovarian function, then we should expect that, since every individual is affected by this change, a more or less marked increase in adipose would be a constant climacteric phenomenon, or at least that it must appear in every normal, healthy woman. But this is not the case, as Krieger[1] has rightly affirmed with emphasis. "We cannot assert," says this author, "that *embonpoint* in women belongs necessarily among the transformations which take place in the body at this period of life. Out of 282 women whom Tilt examined five years after the complete cessation of the menstrual flow, he found that 121 had become stouter than before, 71 had not increased in circumference, and 90 were thinner than they were formerly. The 90 last mentioned did not include all those women in whom the menopause had been associated with many sufferings and diseases, but these were found in about the same proportion as in the 121 who had become stouter; only those women who had had troubles had become thinner during the first half of the climacteric, but during the latter half they had acquired the *embonpoint* which they showed subsequently." I have also frequently had the opportunity of seeing women, whose size did not change at all during the climacteric, or others who became smaller from this very time, although no pathological process had been present in any of these cases. Furthermore, it is a striking fact that a marked increase of fat may take place in women who were slender some years before their periods began to be irregular, as well as at a time when, to all appearance, the ovaries must still be normally active. Thus, I have before me reports of several cases in which the climacteric was supposed to be approaching, by reason neither of advanced age, nor of any marked change in the menstruation, but on account of the commencing increase in adipose; and the same was also true of cases in which the menopause had actually become established, where it is expressly stated that the beginning of the present increased accumulation of fat was to be referred to a time from two or three years before the first menstrual disturbances. On the other hand, it often happens that the menses have ceased entirely and permanently, and in all probability also there is complete cessation of ovarian activity, and yet some years elapse before an increase of fat begins to be noted.

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[1] Wiener Med. Wochenschrift, 1878, No. 20.

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[1] Loc. cit., p. 195.

Finally, another point: I certainly do not know as regards the before-mentioned experience in the case of animals, whether the result there obtained (more rapid fattening) is one to be counted on in all cases; as concerns the extirpation of the ovaries in women, I could show from my own experience, that an increase of adipose does not necessarily take place, even at a much later period. However, if this were so, and if the removal of the ovaries in animals, as well as in man, was certain to cause soon in all cases an increase of fat, it would still be an open question whether the spontaneous retrograde change in the ovaries at the climacteric, and the removal of these organs by the knife, are such equivalents that the inferences to be drawn with regard to the results of the operation may, with perfect propriety, be compared with the conditions at the normal climacteric. We can best overcome these difficulties, in my opinion, if here again we cease to make one phenomenon dependent upon others, and keep firmly in mind more the concomitant symptoms and the equivalence of single phenomena than their mutual dependence. At all events, we can at least meet all the opinions above expressed by classing the accumulation of fat at the climacteric with the various other climacteric phenomena also described in this book. All sorts of disturbances of innervation, psychical abnormalities, etc., which are observed in one case and are absent in another, may appear early in this case (long before the first menstrual irregularities), and late in that one (long after the cessation of the menses), while one accompanying phenomenon may appear of this sort, in another of that. The retrograde process in the ovaries should be regarded as merely the same as the other phenomena described. As regards cause and effect, it is "equivalent," and is simply a constant occurrence in every case. It is not a causal factor in the increased formation of fat, but it itself, as well as the latter, is merely a result of the expressions of that deeply hidden transformation in the vital action of the female organism which testifies to the true nature of the change.

In concluding this chapter, I should like to call attention in connection with the climacteric, to certain eruptions on the skin. There seems to be no doubt that such a connection in general exists, and tnat certain affections of the skin are directly influenced by the menopause, and may also form a part of the "climacteric phenomena.' Of course it is rather difficult in individual cases to draw the line between affections that are due to the climacteric and those which may be entirely accidental complications. The forms in question have no distinguishing characteristic, and they may all appear in a precisely similar manner at another time, and may again perhaps complicate the menopause also. Still, we have certain diagnostic points. If we have certain skin-affections which have never appeared in the individual in question during her entire previous life, but which are observed only during the climacteric irregularities or soon after the establishment of the menopause, and in which every other etiological factor is wanting; or if we have to do with affections which previously appeared but once at the time of puberty, and are observed again only now at the critical time; or if the same affections which now appear were formerly produced by disturbances of menstruation, but by no other cause; finally, if such affections, which, by reason of the connection of the circumstances, in many cases (perhaps also noted by different observers), must be directly regarded as a climacteric phenomenon, then we may generally be allowed to express a positive opinion regarding the significance of the affection under consideration. We have still much to do in elucidating the last point, the repeated confirmation of the fact that a certain skin-affection is a climacteric phenomenon. As far as I have been able to inform myself in this matter, this special significance has been attached to only a few forms of skin-disease. It is therefore certainly fitting that other cases, which, according to their character, may belong to this category, should be carefully reported Many varieties have hitherto been mentioned by this or that author, only as important in this connection. It is highly necessary that additional proof of such statements should be forthcoming.

Perhaps the most common of the affections noted in this connection, is acne of the face, which in many cases is observed at the time of puberty, and then again at the climacteric. Hebra calls attention to the frequency of comedones and acne (so-called "impure complexion"), especially with irregular menstruation, which every physician frequently has an opportunity to confirm, and he describes the special form—acne rosacea—as characteristic of puberty and the change of life. Niemeyer, Cohnstein, *et alii,* refer to the frequency of the latter form, especially during the climacteric years.

I observed a case of so-called milium after the menopause in a woman of fifty-six. Although this woman had not observed them before, of late years the sebaceous glands over the entire right shoulder were enlarged so as to form white globular bodies, and the skin in consequence felt quite coarse and greasy, while elsewhere it presented the normal smoothness. To the characteristic "ardor fugax" before referred to, which is especially characteristic of the climacteric, should be added Kisch's[1] erythema and roseola, simple hyperæmiæ of the skin which appear "in the form of larger or smaller vivid red patches, most frequent at the sides of the neck, on the breast, and face, especially under the influence of some violent psychical irritation." "They appear suddenly, come flying over the skin, as it were, and usually disappear after the lapse of a few minutes." The form of hyperæmia here described is doubtless one of the most common phenomena at the menopause. When consulting the physician especially, these usually quite large, sharply marked, transient red patches (due to the momentary excitement) are often observed. I have regarded these as among the most transient forms of erythema. The conditions that determine their locality, appearance and manner of appearing and disappearing, justify us in assigning the special affection to some extent to a category of its own; still it seems to me to be important to mention that it is extremely probable that more serious forms of erythema should also be connected with the climacteric, such as show more or less the character of dermatitis, and therefore, as is known, are so regarded by some authors, by others, however, as erythema. The following case is interesting: Mrs. S., aged forty-eight, had long suffered with migraine and gastric catarrh, both of which improved at the menopause. She began to be irregular at forty-five; early in the Spring, two days after a period, she had a slight reddening of the skin on the inner side of the right knee, which persisted for four days. On the fifth day it extended over half of the thigh and leg, and appeared on the left knee, gradually over the thigh. There was slight œdema, burning and itching, but no fever. After fourteen days the redness disappeared in the same order in which it appeared, and there was marked peeling. The history showed that this woman had had a similar affection on one occasion only, just at the time of puberty. Krieger[2] mentions furunculosis as an example of "the appearance of new troubles" at the menopause. Mrs. E., aged fifty two, who had for a year been troubled with the first menstrual irregularities, told me that during this year, now and then, a pustule had appeared on the ala of the nose, or even on the inside of the nostril, a thing that had never occurred before in her whole life.

Cohnstein[3] frequently had an opportunity of observing the chloasma of the face, that appears in connection with pregnancy and sexual disease, at the menopause, "especially when the skin, in consequence of poor nutrition, had assumed a rugose condition." The same author calls attention, as above stated, to a special cause for the itching of the vulva and vagina, which is especially frequent at the climacteric. In consequence of the continual scratching with this affection, other skin diseases are known to occur, such as excoriations, etc. I have already mentioned other demonstrable causes of pruritus, which may possibly also stand in relation to the menopause. Wilson considers prurigo and eczema as the most frequent skin affections of the climacteric period.[1] As regards the latter affection, I, in common with others, observed a Mrs. D., aged fifty-six, who after the establishment of the menopause had varicose veins and patches of eczema around them, covering both thighs, legs and the sacrum. Mrs. H., forty-four years of age, has not menstruated for six months. During the last two years, while the rest of her skin remains perfectly pure, she has had in the supra-clavicular fossa a patch of eczema, which disappeared and returned several times a year. Mrs. D., aged forty-five, who has been irregular during the past two years, has had for four weeks itching, eczematous patches on the flexor surfaces of both knees.

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[1] The Climacteric Period in Women, p. 167.

[2] Loc. citat., p. 196.

[3] Loc. cit.

Urticaria is also an interesting affection to remember in this connection, I think. Hebra distinguishes a variety that is closely connected with uterine irritation (disease of the uterus, menstruation, pregnancy). Kaposi affirms quite positively that there is a chronic and symptomatic urticaria resulting from dysmenorrhœa, amenorrhœa, chronic hypertrophy and sterility. It would doubtless be useful to ascertain whether the climacteric changes of the female sexual system do not also cause a predisposition to this peculiar skin affection. If we take into consideration the other factors which are known to cause urticaria, we must admit that some of these, as chronic gastric and intestinal catarrh, and persistent psychical irritation, occur very frequently at the time of the menopause. And if we exclude this (symptomatic) urticaria, due to reflex irritation from the internal organs, many an idiopathic urticaria (produced by direct irritation of the skin) may also perhaps be shown to be connected with the climacteric. Since, indeed, it is possible for a patient to possess the peculiarity " that itching at one point on the skin causes such an irritation that, being transmitted by the sensory nerves, urticaria-wheals appear in a reflex way on other entirely different parts of the body, and on many such parts, and we, therefore, " meet with urticaria in all the affections in which itching is generally present,"[2] the intense itching of the skin, which is so often present at the climacteric, may doubtless lead occasionally to urticaria. In all cases of this kind the skin affection in question results from a local change, due to the climacteric. Now it is still a question whether the matter is settled, or whether there is not possibly still another form of urticaria, which is the direct consequence of general changes in the organism, peculiar to the menopause. Kaposi mentions among the etiological factors of chronic and symptomatic urticaria, in addition to "demonstrable disease of some internal organ," also indefinite general conditions (somatic and psychical), and cites them as illustrative of the latter form, and also of those cases in which the urticaria must be regarded as only the expression of a general senile marasmus. It is not unlikely that a corresponding form of urticaria may be produced by the climacteric as such. This applies especially to chronic urticaria. It must be much more difficult to prove that occasionally a case of acute urticaria (usually, as is known, caused by epizoa, by nutritive ingesta, or by drugs) can be directly connected with some climacteric process. There must in such cases be a causal factor, which depends upon some climacteric change, but is only of short duration. We may possibly obtain such support by excluding every other causal factor, or in the circumstance that the individual in question had had the eruption before, and had had it only once or twice during this period, or finally, that (again excluding all other causal factors) the acute urticaria in an individual was observed only at the time of puberty, and then again at the menopause. Without wishing to draw any conclusion from one case or another, I should like in this place to report the following cases:

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[1] Kisch, p. 164.

[2] Kaposi, loc. cit., p. 247.

Mrs. A., aged forty-five, the mother of four children, has been irregular in her menstruation for two years. Suddenly on one ocasion, without any known cause, her entire body was covered for half a day with urticaria-wheals. She was sure that this had occurred only once before, just before puberty.

Mrs. D. O., aged forty-seven, has been irregular for two years. Recently, just at the time when her period, if present, would have been over, she had a severe urticaria on the forefinger and thumb, which lasted for about an hour, and returned in the same place during the succeeding three or four days, lasting the same length of time. It was absolutely impossible to discover any cause; the patient had never before had this eruption.

Finally, allow me to call attention quite briefly to another skin affection, herpes zoster. Bärensprung taught us that this eruption always follows the course of a spinal nerve, and that it is due to disease of the corresponding inter-vertebral ganglion (the ganglion Gasseri). Kaposi affirms that disease in the nerve-centre itself (the spinal cord), or at some point in the peripheral portion of the nerve should be regarded as the possible cause, but he lays special stress upon "hemorrhage and inflammatory irritation of the spinal ganglia."[1] This author also mentions as occasional causes neoplasms, cancer, tubercle, suppurating foci, and periostitis, inflammatory exudations and inflammations in general (by which inflammation of adjacent nerve trunks is produced), poisoning by carbonic oxide gas (Charcot, Mongeot), and the internal use of arsenic. We see that the causes here are quite remote, and that consequently the idea that there is some connection between zoster and the functional changes under consideration is of limited application, even when a case does occasionally occur, in which this theory seems plausible. But let us go a little further. In addition to the causes above mentioned, Kaposi himself observes that in most cases of zoster such causes cannot be demonstrated; he mentions then eruptions of zoster, which he has seen result from traumatic irritation of the nerves (from a shot, cut or blow), but this dermatologist says nothing further. Now I have recently read a paper by Dr. M. Weiss of Prague,[1] in which he shows on the authority of prominent writers, that there is a central cause for certain forms of zoster, as in symmetrical zona, a case of recurrent zoster (Kaposi), zoster in connection with myelitis, tabes, spinal meningitis, progressive muscular atrophy, epidemic cerebro-spinal meningitis, cerebral hemorrhage, etc., but at the same time he mentions how easily these cases may admit of a different pathogenetic interpretation. In symmetrical zoster there may be simultaneous disease of the symmetrical peripheral nerves, or inter-vertebral ganglia; in cerebral and spinal affections perhaps the process extends from the central organ towards the periphery, the zoster accompanying epidemic cerebro-spinal meningitis may be due to infection, etc. Only after every other cause has been excluded, can we entertain clinically the idea of a zoster of cerebral or spinal origin. However, there are such cases. Bertholle published an account of one, and Weiss himself is able to report one. Clinically, and with reference to the cause, Weiss distinguishes three principal varieties of zoster, the toxic, neurotic, and tropho-neurotic. The first is caused, like other toxic dermatoses, by an inflammatory irritant circulating in the blood, and is essentially infectious (zoster accompanying cerebro-spinal meningitis). The second results from primary or transmitted neuritis or peri-neuritis due to wounds, cold or adhesive pleurisy; according to him, the inflammatory process may extend from the nerve-endings to the tissue of the skin. Finally, we are to regard as tropho-neurotic zoster that form which, after excluding all these conditions, we can refer to an affection of the central nervous system, or of the trophic fibres that run in the same. If (as in the case of Mrs. L., described below) I was, as the result of observation, induced to think of a possible connection between an eruption of zoster and climacteric conditions, I should, by this last-quoted definition, find myself limited to the group of zosters with which the cases in question should, in all probability, be classed. It was naturally important for me to compare the phenomena accompanying the tropho-neurotic zoster in Bertholle's and Weiss's cases with the possible abnormalities during the climacteric. In Bertholle's case psychical affections formed the constant cause of the eruption of zoster that appeared on seven occasions; the eruption was always preceded by severe migraine. In the case recently reported by Weiss, there were at first persistent psychical troubles, a feeling of pressure on the head, depression, photopsia, with loss of appetite and sleeplessness, followed by local pains, formication, numbness, and finally an eruption of zoster at the affected spot. There appeared also in the same locality, hyperhidrosis, local atrophy and disturbance of motion, and a shining appearance of the skin, which seemed to be as thin as paper. After the eruption had recurred several times, an almost complete *restitutio ad integrum* occurred, which was supposed to be due to an improvement in the mental condition.

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[1] Eulenburg, VI., p. 428.

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[1] Wien. Med. Wochenschrift, 1885, No. 47.

As regards the attendant phenomena, I cannot dwell upon them here, but must refer to the original. If I consider only the points that seem to stand in direct connection with these cases of zoster, it can hardly be denied that they present a certain similarity to the climacteric phenomena with which we are already familiar. After what has been stated in these pages, the comparison is self-evident. But if this comparison holds good to some extent, then we are also to a certain degree justified in saying that all cases of zoster, which appear at about the corresponding time of life, and are attended only by some climacteric phenomenon, stand in direct relation with the menopause, *i.e.*, that they constitute in themselves a climacteric phenomenon. This opinion of mine is strengthened by Weiss's own explanation of his case, *viz.*: "In consequence of mental emotions, there probably occurred, through the medium of the vaso-motor system, a moderate disturbance of nutrition in that section of the spinal cord in which are the centres for the trophic and sweat-fibres which run to the periphery in the median nerves (which were specially affected in this case), whereby the function of these centres is altered, and thus the disturbances were produced." Just such transient, limited trophic disturbances, and resulting functional changes in single centres, it must, in my opinion, be possible to demonstrate in connection with the climacteric, at least it seems to me that this view is justified by many other climacteric changes, which are not less striking in character and concerning the nature of which there is no longer any doubt.

The case, the observation of which led me to the foregoing reflexions, was the following: Mrs. L., aged fifty-five, of a nervous family, matured at sixteen, married at twenty-three, and had six children. She was irregular between forty-two and fifty; before this time she suffered with severe migraine for fourteen years, which has been relieved since she entered upon the menopause. Previously the attacks recurred not oftener than once or twice a year, and lasted about a day. Since then she has had attacks of congestion, sweating, palpitation, various neuralgiæ, and especially mental depression. At fifty-one, one year after the complete cessation of menstruation, without any demonstrable cause, there occurred in connection with a marked increase of her general nervousness, an outbreak of exquisite right-sided zoster of the neck, (partly confluent), which lasted in all something over five weeks. The following year a second, but less extensive, eruption of vesicles occurred on the same spot, and was attended with the same violent burning sensation. Since then the patient has remained free from any indication of a recurrence.

CHAPTER VI.

THE LIMITS OF THE MENOPAUSE.

AFTER finishing the foregoing descriptions, I conclude the task which I originally set before me to discuss thoroughly the principal phenomena of the climacteric. Of course I was not able from my own experience to treat this important subject in a perfectly exhaustive manner. This requires the continued labor of many observers; still, I think that in what I have said here, I have contributed in some degree to the clearing up of questions in this special department which still remain unsettled, and perhaps also have opened up new ideas in one direction or another. Wherever this seemed important to me, I have also pointed out the way in which more exact work was originally hindered, or, by reference to what had already been accomplished, what further observations were desirable.

Before I conclude this work, I have still a task to perform. I have called attention with some emphasis, earlier in the volume, how, in my opinion, the true character of the menopause could be properly interpreted only in one way. I hold, however, and I have already called attention to this several times before, that it is necessary to settle definitely the question of the extension of the climacteric. As I said in the beginning, it has always been the traditional custom to date the commencement of the menopause (according to the age of the individual) from the first irregularities in the menstrual flow, and to make the duration of the menopause correspond with the duration of these irregularities; finally, to consider the entire cessation of the genital hemorrhages as the termination of the menopause. Whatever notable occurrence takes place subsequent to this time, is described as a post-climacteric phenomenon. In general, the notion of the " climacteric period " is fully identified with the prolongation of the menstrual irregularities that are present at this time of life. In the same sense also the expressions "climacteric" and "menopause" are usually employed as synonymous terms. If now we consider the current definition of the climacteric period (which we combated at the beginning of this work), and which implies that by the term climacteric is understood that phase in the life of woman at which her sexual activity ceases, then it follows from these two points, that our idea of the climacteric rests upon a sound hypothesis, and that the disappearance of sexual activity in woman may be accurately inferred from the condition of the flow at a given time. After all that has been said in the foregoing, and after what we know regarding the probably very loose connection between ovarian activity and menstrual hemorrhage, this is always a somewhat hazardous undertaking. But let us leave this side of the question for the time being; it is necessary for many reasons to describe accurately those periods which intervene between the first menstrual irregularity, and the final cessation of the menses, and it is proper on the other hand, as I have also already remarked in the beginning, that these irregular hemorrhages should usually be regarded as the most striking evidence of the changes in the genital tract referred to. There is another point that seems to me to be far more important, and that is, whether we can accordingly employ the term climacteric period in all cases, which as every one will admit, is a rather important question. This, as we may daily prove to ourselves, does not follow. Physicians are already so familiar with most of the climacteric phenomena (and to some extent the laity also), that these should not generally be at once termed such wherever they are observed. These phenomena occur with extreme frequency, as I have repeatedly insisted in the foregoing pages, long before the first menstrual irregularities, and they very often persist for years after the cessation of the flow; still, where no further doubts exist, no one hesitates to describe these well-known phenomena as climacteric, no matter how early they begin or how late they persist. If now the individual enters upon the menopause in the manner already described, as soon as the first menstrual disturbances are observed, and the menopause has been "passed," as soon as the genital hemorrhage is positively at an end, it is perhaps not well to speak of climacteric phenomena so long before this first, and so long after this final, termination. However, the latter course is doubtless the correct one. The inconsistency noted occurs because the true relation of affairs makes it unavoidable. The error lies in this, not that we speak of climacteric phenomena before the commencement of the menstrual irregularities, and after the definite conclusion of these in a given case, but in that in our customary definitions of the term "menopause," we always adhere too strictly to phenomena specially referable to the genital tract, among which the kind of hemorrhages are of course particularly included. Just here, in my opinion, it is most important to apply the lever. The conception of the menopause must theoretically be understood in a wider sense than it has hitherto been, as broad as more earnest observation teaches us it should be. I was careful to explain in the foregoing how one and another recognized climacteric phenomenon often begins very early, or continues long after the menopause has been established. This must be still further proved, in order to establish more definitely the limits of the climacteric, with regard to both the early and late appearance. At all events theoretically, in a given case, the menopause begins with the first positive climacteric phenomenon, and ends with the last actual climacteric phenomenon which is still demonstrable. In practice, as is well known, this law controls our decision (partly, at least) as soon as we recognize somewhat intimately the isolated climacteric phenomena. I said before that it was necessary, for many reasons, to describe accurately those periods also which intervene between the first menstrual irregularity, and the final disappearance of the menses. We must at all events hold fast to this. Describe this period as the period of climacteric irregularities, as the period of menstrual irregularities at the climacteric; give any scientific name to it, only do not call it positively a climacteric, or the change of life, for that does not harmonize with that conception of the true change of life, which is partly traditional with us, and which continued observations will certainly always establish more firmly. The real change of life, as we may demonstrate one hundred times with careful observation, commonly stretches over a much longer period than that occupied by the above-mentioned menstrual irregularities at the climacteric. In this sense, also we ought, I think, no longer to be satisfied with the special definition of the climacteric as that period of life in which the sexual activity is extinguished. By this definition the true nature of the climacteric is not embraced in its entirety; in it is included only one of the phenomena, though perhaps the most important. But this introduces an error, and usually leads us, by concentrating our attention upon the one phenomenon, to overlook or to under-estimate the others. This leads us again to recognize in the condition of the flow (beginning irregularities, etc.), this criterion which is at all events convenient, but is nevertheless very unreliable as an indication of the more deeply-seated processes in the genital organs, the root of the matter, and from them to infer the presence of the supposed retrograde metamorphosis within the uterus, and, that which is most important, through their very particular consideration of the processes within the abdomen, to lose sight of and interest in the revolutions that take place in the entire organism.

Thus it may perhaps happen that, in order to avoid the latter reproach, we speak of precursors and after-pains of the climacteric (these are those further climacteric phenomena referred to above), as well as of a true climacteric, which as regards its duration, corresponds with that of those menstrual irregularities which continue until the final cessation of the menses; still that too can certainly not be done without doing violence to the facts. To speak of all the processes that occur in the genital organs as simply an expression of the real climacteric, and, in spite of their great significance, and their constant occurrence (which distinguishes it from all other climacteric phenomena) to give to every one of these phenomena the same significance, and not to consider them specially in connection with the determination of the limits of the climacteric, this is certainly the first step which must be made towards the proper conception of this important period.

We saw before that certain peculiar psychical abnormalities and well-known characteristic phenomena, such as vertigo, flushing, outbreaks of perspiration, an increased accumulation of fat, etc., appear some time before the appearance of the first menstrual irregularities, and may likewise persist for some time after the final cessation of the flow. We always agree in considering these phenomena as evidences of the menopause, so far as they fall within the limit of menstrual irregularities; before and after we refer to them in a different manner, or regard them, as was said, as phenomena of the change of life, yet we describe them (since the periods still recur regularly, or have already been entirely absent for a long time) as premonitory signs, or as the final knell of the climacteric. This is entirely incorrect logically. The early (in regular menstruation) or late (after the cessation of the genital hemorrhages) psychical abnormalities, which occur with the same intensity as during the menstrual irregularities, the early or late attacks of vertigo and outbreaks of perspiration, etc., which are just as marked as they are during the menstrual irregularities, always show that the changes within the body, which lie at the bottom of them, exist to the same degree. If we designate the *ensemble* of these changes by the term "climacteric," we have accordingly to speak not only apparently of a definite group of phenomena, which owe their existence to these changes, but of every such phenomenon of the climacteric; or, in other words, we must regard the limits of the extension of the climacteric as determined by the first and last undoubted climacteric phenomenon, without disturbing ourselves as to what these phenomena may be, and what other ones may intervene.

I must also add a word regarding those so-called critical hemorrhages. These are made use of as criteria in deciding as to the deeper-seated processes in the genital organs, and the so-called change of life, *i.e.*, time of cessation of sexual activity, is defined by the appearance of these hemorrhages, as well as by the cessation of the same. No one will deny what I said above, that this influence must be only a very vague one, since the connection between these two facts (hemorrhages and deeply-seated metamorphosis) is hardly a very close one. There is without doubt a casual relation, and on this is based our conception of the menopause, certainly not the less on this account, that the clinical symptom, hemorrhage, is one very easily observed. If, however, the critical hemorrhages and the supposed changes in the internal sexual organs do not correspond in the usual manner, then the beginning of the cessation of menstrual activity must very often be inferred long before the time of the first menstrual irregularities (compare the commonly observed cessation of child-bearing towards the menopause), and the "end" of this cessation of sexual activity will probably be generally looked for some time after the disappearance of the flow. Puech found the ovaries still of normal size three years after the establishment of the menopause. It is quite possible that the beginning and end of cessation of the sexual activity may, in point of time, be nearer to the first and last of the other climacteric phenomena than to the first and last critical hemorrhage, and it is accordingly from this standpoint also probable (since the attention is directed chiefly to the cessation of the sexual activity) that it is much more correct to enlarge the idea of the extension of the climacteric to the degree mentioned, and instead of the readily-observed, but quite unreliable, symptom of hemorrhage, to recognize as the limits the beginning and concluding phenomena, which at all events demand more exact observation, but are more reliable clinically.

On the other hand, we must also remember the not infrequent cases in which, without the action of any injurious cause, the periods, hitherto perfectly regular, at once disappear permanently. In such cases the before-mentioned critical hemorrhages are entirely absent, and the period which is limited by these hemorrhages is completely wanting; still even in these the cessation of sexual activity must occur within a certain definite period, and in these too a climacteric must take place, from whatever standpoint we may consider it. Here also the criterion furnished by the critical hemorrhages is absent; we speak, as we were obliged to do in the previous pages, of a sudden climacteric, yet every one is perhaps aware that this term "sudden" in such clearly-marked cases (where no injurious factor lies at the bottom of them) merely refers to the one symptom, hemorrhage from the genital organs, which is permanently absent. If, however, we bear in mind that which I said before in regard to the necessary manner of determining the time of the climacteric, we shall understand such cases also; every other climacteric phenomenon can under some circumstances be made use of, in order to attain the result in question. At all events, I observed before that occasionally such a "sudden climacteric" may occur, without any sort of disturbance of the constitution having arisen before or after; still I referred in this only to the question whether such a rapid disappearance of the menses must lead to an actual injury to the health. The attentive observer, even in the cases of this kind which run the most favorable course, will not lose sight of the slight changes in this or that region which he is justified in calling climacteric phenomena.[1] Now I must still, in order to prevent all misunderstanding, refer to two points, *viz.*, so-called post-climacteric phenomena and those isolated phenomena of the menopause which persist for a long series of years, after the flow has normally ceased. With regard to the former, it might be urged that in adhering to the idea of the extension of the menopause in the sense above signified, we must very often speak of a climacteric phenomenon at a time at which we are accustomed to regard certain notable occurrences as post-climacteric phenomena, which must necessarily now and then lead to errors. I must unquestionably admit this, unless hereafter we are not allowed some variations with regard to the use of the term "post-climacteric." But these are absolutely necessary. In the same sense the previous custom of speaking of a post-climacteric period (which I also adopted in the former pages, in order to make myself clear) as soon as only the one symptom—irregular hemorrhages—positively disappears, is not justifiable. Just as we should in general think that the climacteric period is at an end only after the phenomena have disappeared, so the expression post-climacteric should be used when the phenomena, of whatsoever sort they may be, have been absent for a shorter or longer time. It will follow from this that a large number of the occurrences, described here and there as post-climacteric conditions, and related to well-known climacteric conditions, are to be regarded as standing really in direct relation to the menopause. However, we shall see later (and here I hold is the true practical application of the matter) that by adhering to this point of view, we shall be compelled in the future to keep more clearly before us various late phenomena, which we at present regard as accidental, intercurrent, and due to entirely different causes, and thus perhaps be able to show their connection with the climacteric—in short, to widen our knowledge of the climacteric phenomena in general.

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[1] In connection with the "sudden (premature) appearance of the climacteric

The second point concerns the unusual prolongation of certain climacteric conditions (of which I gave some examples in the former pages) and the possible objection based upon it, that it is difficult to regard this entire length of time as the climacteric period, while we were formerly accustomed (even from the observation of irregular hemorrhages) to assign about two years to this same epoch, in exceptional cases somewhat

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from pathological causes," I emphasized the necessity of considering the phenomena in the rest of the body. How far the proper use of the term "menopause" was shown in that chapter appears also from what has just been said, not that we are to consider the premature climacteric as pathological when the ovaries have been destroyed by some injurious cause, but that the injury to those organs may, as is known, produce that essential change in the vital processes of the organism which we have before described as the true climacteric. If we hold fast this idea, it will at once be best evident of what value the general climacteric phenomena are in deciding upon the condition of the ovaries in cases of this character.

longer. In reply I might repeat what I said before, that we must unquestionably allow in the majority of the cases a certain extension of the term "climacteric" considered as a period of time. To one who has given some attention to this question, it seems to be entirely inadmissible to speak again and again of the "menopause being passed" in cases where the women are still afflicted with a number of climacteric troubles, simply because of the fact that they have not had a trace of genital hemorrhage for a long time. On the other hand, however, if we adhere in future actually to the principle laid down above, and reckon the commencement of the climacteric period in a given case, from the first marked climacteric phenomenon, and the termination of the same from the disappearance of the last real phenomenon, according to my experience the difference in comparison with the former will not be proportionally excessive, and will hardly interfere with our general division of the periods of life; moreover, in this way we shall always satisfy better our need of a logical classification of the facts observed than was formerly the case with the methods hitherto adopted in the direction mentioned. We must always accept with a certain amount of skepticism very late climacteric phenomena; such an one will only pass as a climacteric phenomenon with us in the sense above-mentioned, *viz.*: if, after at first existing more or less continuously, it is shown that it is absent for some time, and reappears at a much later period, when all the other phenomena have ceased (or, moreover, if the phenomenon which at first can be referred only to climacteric processes, is perhaps at a later period unquestionably prolonged by another recent etiological factor), or, if the phenomenon in question, although it corresponds perfectly with climacteric symptoms commonly observed, was perhaps at first entirely absent in the case under consideration (while all the other phenomena were present), and appears quite late, long after the other climacteric phenomena have disappeared, etc. In connection with this question we must also take into account the fact that there may be certain nervous states which may be produced by some conditions which exist for some time, and according to experience may readily become permanent, and which may persist for many years after their real cause has ceased to act.

If we sift the matter down in this way, we shall, in the sense which we mean, establish the limits of the climacteric pretty strictly, and we need not fear that the field included by these limits will be too wide. Further practical observation will determine this. So far as I can judge, it will be found that there will generally be a series of well-recognized climacteric phenomena for some years (or less) before the beginning of the menstrual irregularities, and that the final cessation of the menses occurs some years later. These symptoms are of course different in individual cases. We shall perhaps agree in our opinions, if we make our idea of the beginning and end of the climacteric period dependent upon the more or less simultaneous appearance or disappearance of several of these phenomena, as these are ordinarily presented in the individual case. We shall adhere to this division, even when one or another isolated phenomenon is present, and shall in every instance describe such a phenomenon (when no other cause is to be found) as "dependent upon the climacteric," but should not allow ourselves to go further than this and fall into error. We shall, finally, describe as climacteric phenomena, in a given case, certain transient ones (such as I have before described) as are now known to be possibly connected with the menopause, or in which in the future such a relation may perhaps be established—that is, if they occur within the period described, or, on the other hand, if they in some striking manner precede or follow this period.

While in the former chapters I endeavored to lay particular stress upon the great importance of certain individual questions connected with the climacteric, the consideration of the frequent occurrence of anæmia in contrast to the commonly-described "plethora," the investigation of the relation of the menopause to certain pre-existing processes, the question as to whether these or those processes were to be included among the true climacteric phenomena, etc., I desire in these concluding lines to call attention to the necessity of modifying certain general notions which are inseparably connected with the above questions, but which possess great significance in many other ways.

Whether we consider that the long and short of the climacteric lies in the cessation of the sexual activity of woman, and also believe that all the numerous phenomena of this period stand in a certain relation with the changes in the sexual organs; or, whether (as I remarked incidentally) we regard the climacteric as simply a deeply-seated general change in the organism, and assign to the collective processes that occur in the sexual system, as well as to every other climacteric phenomenon, simply the *rôle* of a symptom of this deeper change; moreover, whether we consider that the limits of the climacteric are constituted by the beginning and end of the irregular genital hemorrhages that correspond to this period of life, or whether we consider, contrary to the usual custom (which, as I have already said, is extremely necessary), that the first and last pronounced climacteric phenomenon, of whatsoever sort, or the first and last collection of climacteric phenomena, indicate the beginning and termination of the menopause, all this must unquestionably influence us in our decision in every individual case, I might almost say with regard to every phenomenon, and thus, moreover, determine our whole conduct as medical advisers in the case in question. The important bearing of these things, I think, might be proved by any example that lies nearest at hand. How much well-meant, but useless labor may be devoted to the carrying out of this or that method of gynecological treatment, in order to remove some distressing climacteric phenomenon, which was throughout erroneously believed to depend upon processes situated within the genital tract! How many accidents, quite harmless in themselves, are innocently suspected as the causes of one or the other disturbance, merely because the regular recurrence of the menses gave rise to the idea that the disturbance in question might be a simple climacteric phenomenon, however this may have corresponded to the true condition! How often may one or another somewhat striking anomaly be erroneously regarded as the symptom of a more serious affection, merely because the fact that the genital hemorrhages have been absent for a long time, did not lead to the correct supposition that the observer had to do with a transient climacteric phenomenon!

I ought, perhaps, to have introduced these observations on the character and duration of the climacteric at the beginning of my work, and ought to have made them the basis upon which all the subsequent discussions should rest. I did not do this, since I was obliged to follow out more thoroughly the facts which were presented for discussion, from the same standpoint from which they had already in great part been viewed briefly, or *in extenso* from other directions. I also did not do this, because it seemed to me profitable for my readers to be able to know the result of my conclusions from the outset, and that they might, perhaps, in common with myself, be led, simply from the facts of the case, to adopt the views here espoused.

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